

## INTERNATIONAL COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION  
(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
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in its capacity as elected Office

|   |   |
|---|---|
| Date of mailing (day/month/year)<br>30 March 2001 (30.03.01)          |   |
| International application No.<br>PCT/US00/18511                       | Applicant's or agent's file reference<br>2267.507WO01     |
| International filing date (day/month/year)<br>06 July 2000 (06.07.00) | Priority date (day/month/year)<br>08 July 1999 (08.07.99) |
| <b>Applicant</b><br>BORES, Gregory, W. et al                          |   |

1. The designated Office is hereby notified of its election made:

in the demand filed with the International Preliminary Examining Authority on:

06 February 2001 (06.02.01)

in a notice effecting later election filed with the International Bureau on:

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2. The election  was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

|   |  |
|---|--|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br><br>Facsimile No.: (41-22) 740.14.35 | Authorized officer<br><br>Marie-José Devillard<br><br>Telephone No.: (41-22) 338.83.38 |
|---|--|

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|   |   |  |
|---|---|--|
| Applicant's or agent's file reference<br>2267.507WO01 | <b>FOR FURTHER ACTION</b>   | see Notification of Transmittal of International Search Report<br>(Form PCT/ISA/220) as well as, where applicable, item 5 below. |
| International application No.<br>PCT/US00/18511       | International filing date ( <i>day/month/year</i> )<br>06 JULY 2000 | (Earliest) Priority Date ( <i>day/month/year</i> )<br>08 JULY 1999   |
| Applicant<br>FLUOROWARE, INC.                         |   |  |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:
  - contained in the international application in written form.
  - filed together with the international application in computer readable form.
  - furnished subsequently to this Authority in written form.
  - furnished subsequently to this Authority in computer readable form.
  - the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the
  - the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2.  Certain claims were found unsearchable (See Box I).

3.  Unity of invention is lacking (See Box II).

4. With regard to the title,

- the text is approved as submitted by the applicant.
- the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- the text is approved as submitted by the applicant.
- the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 5

- as suggested by the applicant.
- because the applicant failed to suggest a figure.
- because this figure better characterizes the invention.

None of the figures.

## Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The technical features mentioned in the abstract do not include a reference sign between parentheses (PCT Rule 8.1(d)).

## NEW ABSTRACT

A wafer container with door receiving frame and a door sized therefor. The door (94) includes latching linkages (250,252) that extend, lift, lower and retract latching portions from the door and into and out of latch receptacles (150) in the door frame. Each latching mechanism utilizes a sliding plate (210) with a connected handle (170,172) exposed on the front of the door. The sliding plate has lifting linkages (220,222) cooperating with the latching linkages. Moving the handles extends the latching portions into the latching receptacles. By way of a ramped surface (226) and follower surface (277) on the overlapping linkages, the latching portions then move in a direction normal to the first direction to pull the door inwardly and seal the door to the container. The sliding plate includes a rack portion (224) engaged with a pinion (290). The pinion is accessible from the door front by a latch key (300).

← Exposure of the  
latching mechanism on  
the front door panel  
facilitates cleaning.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/00/18511

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :B65D 85/90

US CL :206/711; 414/217.1

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 206/454, 711; 211/41.18; 414/217, 217.1, 292, 416,

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category*           | Citation of document, with indication, where appropriate, of the relevant passages                                  | Relevant to claim No.                 |
|---------------------|---|---------------------------------------|
| X                   | US 5,173,273 A (BREWER) 22 December 1992, see Figures 1, 2, 2a, and column 4, line 7 through column 6, line 43.     | 1, 2, 4, 5                            |
| X                   | US 5,711,427 A (NYSETH) 27 January 1998, Figures 1, 2, 7, and column 2, line 33 through column 3, line 57.          | 5, 6                                  |
| X,P<br>-----<br>Y,P | US 5,988,392 A (HOSOI) 23 November 1999, see Figure 6 and column 6, lines 49-51.                                    | 10, 12, 14, 15, 17<br>-----<br>13, 16 |
| Y                   | US 5,915,562 A (NYSETH et al) 29 June 1999, see Figures 1 and 23, column 3, lines 16-39, and column 7, lines 15-37. | 13, 16                                |

 Further documents are listed in the continuation of Box C. See patent family annex.

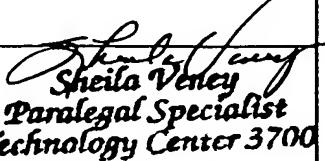
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| * Special categories of cited documents:  | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  |
| "A" document defining the general state of the art which is not considered to be of particular relevance  | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone   |
| "E" earlier document published on or after the international filing date  | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family  |
| "O" document referring to an oral disclosure, use, exhibition or other means  |     |  |
| "P" document published prior to the international filing date but later than the priority date claimed  |     |  |

Date of the actual completion of the international search

26 SEPTEMBER 2000

Date of mailing of the international search report

18 OCT 2000

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

**(19) World Intellectual Property Organization  
International Bureau**



A standard linear barcode is located at the bottom of the page, spanning most of the width. It consists of vertical black bars of varying widths on a white background.

**(43) International Publication Date  
18 January 2001 (18.01.2001)**

PCT

(10) International Publication Number  
**WO 01/04022 A1**

(51) International Patent Classification<sup>7</sup>: B65D 85/90

**(21) International Application Number:** PCT/US00/18511

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**(22) International Filing Date:** 6 July 2000 (06.07.2000)

(81) **Designated States (national):** AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

**(25) Filing Language:** English

**(84) Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**(30) Priority Data:** 60/142,831 8 July 1999 (08.07.1999) US

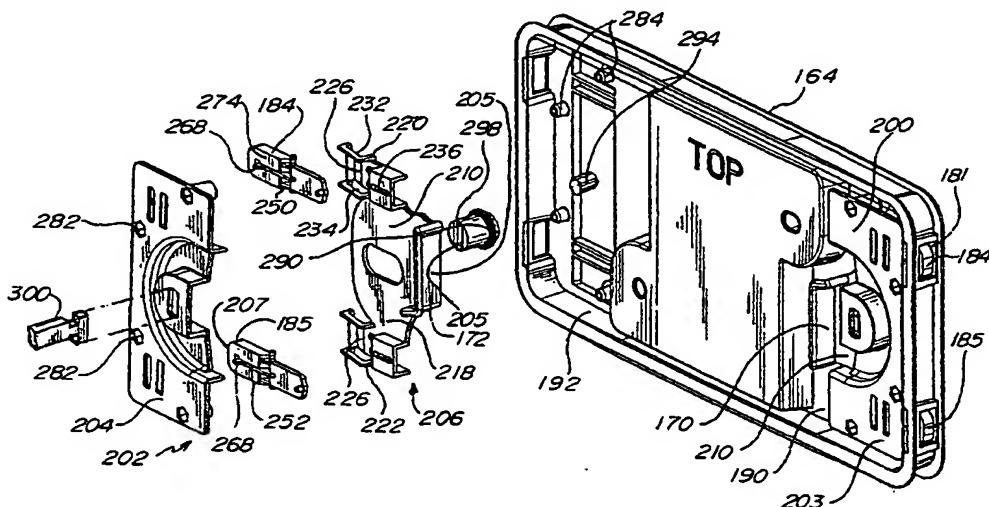
**Published:**

— *With international search report.*

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**(54) Title: TRANSPORT MODULE WITH LATCHING DOOR**



WO 01/04022 A1

**(57) Abstract:** A wafer container with door receiving frame and a door sized therefor. The door (94) includes latching linkages (250, 252) that extend, lift, lower and retract latching portions from the door and into and out of latch receptacles (150) in the door frame. Each latching mechanism utilizes a sliding plate (210) with a connected handle (170, 172) exposed on the front of the door. The sliding plate has lifting linkages (220, 222) cooperating with the latching linkages. Moving the handles extends the latching portions into the latching receptacles. By way of a ramped surface (226) and follower surface (277) on the overlapping linkages, the latching portions then move in a direction normal to the first direction to pull the door inwardly and seal the door to the container. The sliding plate includes a rack portion (224) engaged with a pinion (290). The pinion is accessible from the door front by a latch key (300).

TRANSPORT MODULE WITH LATCHING DOORBACKGROUND OF THE INVENTION

This invention relates to wafer carriers. More particularly it relates to sealable wafer enclosures having doors with latching mechanisms.

Various methods have been utilized for enclosing wafers in containers. For such storage and shopping some containers have rigid bodies with vertical slots for receiving the wafers and with flexible snap-on covers. These containers are generally not suitable for use in applications where the wafers are not to be exposed to the ambient atmosphere.

For wafers in the range of 200 mm and smaller, containers known as SMIF (standardized mechanical interface) pods 20 such as shown in FIG. 1, have been utilized to provide a clean sealed mini-environment that allows transfer of wafers into processing equipment without exposing the wafers to the ambient atmosphere. Examples of these pods are shown in U.S. Patent Nos. 4,532,970 and 4,534,389. Such SMIF pods typically utilize a transparent container portion 34 with a lower door frame portion 35 configured as a flange defining an open bottom 52 and a latchable door 36 that closes the open bottom. The door frame portion 35 clamps onto processing equipment and a door on the processing equipment attaches to the lower SMIF pod door. Both doors may be simultaneously lowered downwardly from the shell into a sealed processing environment in said processing equipment. A separate H-bar carrier 38 positioned on the top

surface 40 of the SMIF pod door 36 and loaded with wafers is lowered with the pod door for accessing and processing said wafers.

The semiconductor processing industry has moved toward utilization of larger wafers, specifically 300mm wafers. Transport modules for such wafers, by way of developing industry standards, utilize a front opening door that drops downwardly from the module. Referring to FIG. 2 such a front opening enclosure is shown. Such an enclosure has analogous components within the container portion 34 without a separate removable carrier.

Conventional configurations of door enclosures and latching mechanisms for sealable enclosures are known in the art. Generally, these typically have the disadvantage that they are not easily disassembled, they have numerous moving parts, and they utilize metallic parts including fasteners. The use of metallic fasteners or other metal parts is highly undesirable in semiconductor wafer carriers or containers. Metallic parts generate highly damaging particulates when rubbed or scrapped. Assembly of a module with fasteners causes such rubbing and scrapping. Thus, the use of metal fasteners or other metal parts in wafer enclosures is to be avoided.

Although enclosures as described above are utilized in relatively clean environments, such enclosures will over time accumulate contaminants on the enclosure, in the enclosure, and in the interior of the door enclosure ultimately requiring cleaning. Such contaminants may be created by the rubbing of

parts such as the operation of the door latching mechanism as described above, by the wafers being loaded and unloaded on the wafer shelves, and by the door being engaged and disengaged with the container portion. The numerous parts in conventional latching mechanisms, the difficulty of disassembly of the doors, and the use of metallic fasteners make the cleaning of such doors difficult. Easily disassembleable doors, with easily disassembleable latching mechanisms, and with minimal moving parts are highly desirable.

The larger doors required for larger wafer carriers require secure latching mechanisms in the doors. Ideally, such mechanisms will be mechanically simple with few moving parts and no metal parts.

Recently front opening transport modules have been developed that satisfies many of the above requirements. See, for example, U.S. Patent No. 5,915,562 to Nyseth and Krampotich and assigned to the owner of the invention of this application. Also see Serial No. 08/904,660, in which the issue fee has been paid, to Eggum, Wiseman, Mikkelsen, Adams, and Bores, also assigned to the owner of the invention of the instant application. The '562 patent and allowed 08/904,660 application are incorporated by reference herein. These latching mechanisms, as well as the other wafer carrier latching mechanisms known in the art, will typically use rotatable cammed members. These cammed members have typically been formed of generally circular plastic plates with elongate recesses defining cam surfaces.

In prior art carriers such latching mechanisms were enclosed within door enclosures. Such enclosures generally will isolate and contain any particle generation created by the latching mechanism. Such particles can accumulate and eventually need removal and cleaning. Traditionally, wafer carriers including wafer containers are cleaned with water solutions and dried with pressurized air or gases. Such cleaning is critical in keeping yields up. In order to effectively accomplish cleaning, the doors need to be disassembled or at least have covers removed exposing the latching mechanisms. This process is labor intensive and tedious. To the extent the cover is not removed, access and cleaning of the interior is difficult. Also if washing is accomplished with the latching mechanism enclosed, drying of the enclosed latching mechanism is problematic.

The rotatable cammed members are particularly useful in conforming with the industry standards for robotically opening the 300mm carrier doors. See SEMI E62, Provisional Specification for FIMS Door, available from the Semiconductor Equipment Manufacturers Institute, Mountain View, California, and attached as an Appendix. These standard requires the use of two parallel spaced tools, termed "latch keys" which are robotically inserted into a door. Both tools are simultaneously rotated clockwise to unlatch the door. Consistent with these standards, conventional front opening transport modules or shippers for 300mm wafers utilize two separate latching mechanisms, one for each side of the door.

Such mechanisms that are also manually openable, utilize handles that also turn the internal cammed member. Traditional

300mm shippers that have such manual handles require each of two such handles to be separately rotated and then the door is manually removed by pulling on the manual handles. Such separate rotational movement by each hand of an operator is non symmetrical, awkward, and generally counterintuitive. Additionally it is difficult to ascertain if each rotational handle has been turned the full necessary rotation for full latching or unlatching.

Although such rotating cammed members function in wafer carrier doors, they have several deficiencies. The rotatable cammed member can be difficult to design and fabricate and they typically require relatively large circular cammed members for reasonable mechanical advantage. Reducing the size of such cammed members reduces the mechanical advantage. Moreover cammed members do not typically have smooth operation when translating the rotational motion to a linear motion that is irregular as is appropriate in latching and unlatching applications. Particularly, when manually rotating such rotating cammed members, false stops may occur before the latch portions are fully extended or retracted.

Moreover, such cammed rotatable members are inimical to providing a supplemental non-rotational manual grasping latching/unlatching handle. Providing rotating supplemental manual handles are known. However, such handles that rotate provide a very insecure handling means which can lead to non-smooth cumbersome manual placement and removal of doors from the door openings of the enclosure portions. Such non-smooth operation can lead to inadvertent contact between the door and enclosure at the door opening causing scrapping with particle

generation, disruption of seating of the wafers, particle launching from the carrier, or other undesirable consequences. A wafer door with a latching mechanism would ideally have grasping handles that manually operate the latching mechanism that are non-rotating.

A manually operated door that is smoothly, easily and intuitively operated and that has a simple mechanical design is needed. Moreover, such a door is needed that complies with the industry standards for robotic operation of the door.

#### SUMMARY OF THE INVENTION

A wafer container has an open front defined by a door receiving frame and a door sized for the door receiving frame. The door receiving frame has slots on opposite sides and the door and utilizes two latching linkages that extend, lift, lower and retract two latching portions from the edge portion of each opposite side of the door and into and out of latch receptacles on the door receiving frame. In a preferred embodiment, each latching mechanism utilizes a sliding plate with a handle connected thereto and exposed on the front of the door. The sliding plate has a pair of lifting linkages cooperating with a pair of latching linkages. Moving the handles outwardly first extends the latching portions in a first direction into the latching receptacles and then by way of a ramped cam surface and cam follower surface on the overlapping linkages, the latching portions move in a second direction normal to the first direction to pull the door inwardly and to seal the door to the container portion. The sliding plate includes a rack portion engaged with a pinion. The pinion is accessible from the front

of the door by a latch key whereby the mechanism can be operated robotically. Thus a latch mechanism is provided with a non-rotating grasping handle that provides a secondary means for operating the latch. In a preferred embodiment the entire latching mechanism is exposed on the front of the door.

An object and advantage of preferred embodiments of the invention is that a non-rotational means is provided to operate the latching mechanism.

An object and advantage of preferred embodiments is that the latching mechanism is exposed on the front of the front door facilitating cleaning and drying of the mechanism, visually assuring proper operation, and generally providing easy access to the mechanism if maintenance is needed.

An object and advantage of preferred embodiments of the invention is that there are no door enclosures. This minimizes the number of components, simplifies assembly, and reduces cost.

An object and advantage of preferred embodiments of the invention is that the manual motion to latch the door is intuitive, that is, moving the handles outwardly toward the periphery of the door extends the latch portions. Moving the handles inwardly retracts the latch portions.

A further object and advantage of preferred embodiments of the invention is that the manually operable latch mechanism of the door is also robotically operable.

A feature and advantage of preferred embodiments of the invention is that the latching mechanism operates smoothly particularly when compared to mechanisms utilizing rotating cammed members.

An advantage and feature of the invention is that the latching mechanism utilized is comprised of a minimal member of component parts that are mechanically simply yet provide an effective and reliable latching action.

Another feature and advantage of the invention is that the mechanism is positioned in the interior of the door thereby minimizing the generation and dispersal of particles by the door mechanism.

When used herein "substantially" includes the quantity, quality, or position exactly as indicated. "Connected" and variation thereof do not require direct connection or contact and the elements connected may be linked by way of mechanisms or couplings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a prior art SMIF pod.

FIG. 2 is a perspective view of a prior art transport module.

FIG. 3 is a perspective view of a prior art transport module with handles for manual operation and openings for robotic latch keys.

FIG. 4 is a perspective view of a wafer container in accordance with the invention herein.

FIG. 5 is an exploded view of the front sides of components of the door of a wafer container in accordance with the invention herein.

FIG. 6 is an exploded rear view of a latch mechanism in accordance with the invention herein.

FIG. 7 is an elevational view of a front of an assembled door in accordance with the invention herein.

FIG. 8 is a cross sectional view of a latching mechanism with the latching portion retracted in accordance with the invention herein.

FIG. 9 is a cross sectional view of a latching mechanism with the latching portion extended in accordance with the invention herein.

FIGS. 10a and 10b are a perspective views of the front and back or a door of a wafer carrier in accordance with the invention.

DETAILED SPECIFICATION

Prior art FIGS. 1 and 2 show a bottom opening SMIF pods 20 and a front opening transport module 30 respectively for which the invention is highly suitable. Each sealable enclosure has a container portion 34 and a cooperating door 36. The SMIF pod 20 also has a separate wafer carrier 38 which is a H-bar carrier, well known in the art, which seats on the top surface 40 of the door 36.

Each container portion 34 and each enclosure has a top side 46, a front side 48, and a bottom side 50. In the SMIF pod the bottom side 50 is open for receiving the wafer carrier 38 and the door 36.

The doors have an inwardly facing side 52, an outwardly facing side 53, and a periphery 55 comprise an enclosure 56 with an open interior 58 which contains a latching mechanism 60, a portion of which is shown in FIGS. 1 and 2. The latching mechanism includes a latching portion 62 which is extendable out of slots 66 to engage into latching portion receivers 68 located in the door frame portion 74 of the container portion 34.

Referring to FIG. 3 prior art wafer container is shown which illustrates handles 80 which may be swung outwardly to facilitate rotation of same. Said handles are coupled to a rotatable cammed members in each respective door enclosure.

Referring to FIG. 4, a wafer container 90 incorporating the invention is illustrated and generally comprises a container portion 92 and a cooperating door 94. The container portion has

a plurality of wafer slots 100 for insertion and removal of wafers W in substantially horizontal planes. The slots are defined by the wafer support shelves 102. The container portion generally has an open front 106, a closed top 108, a closed left side 110, a closed back side 112, a closed right side 114, and a closed bottom 116. The container will typically have an equipment interfaces, not shown, on the outside of the closed bottom.

The door 94 seats into and engages with a door receiving frame 120 which may or may not be integral with the shell 124. The door frame 120 has two pairs of opposing frame members, a vertical pair 130, 132 and a horizontal pair 136, 138. The vertical frame members each have a pair of receivers 150, configured as apertures or slots which are utilized in engaging and latching the door to the container portion. The door may have an active wafer regaining means such as disclosed in U.S. Patent No. 5,915,562 which is incorporated by reference herein, or a passive means as is well known in the art.

The door may utilize a front cover 160, configured as a panel, which is suitably secured, such as by spring members as disclosed in serial no. 08/904,660 which is incorporated herein by reference, and a housing 162 which form an enclosure 164. Two actuation portions configured as manual handles 170, 172 extend through apertures 174, 176 in the front cover. Latch key holes 180, 182 provide robotic access to additional actuation portions configured as key receivers. Latching portions 184, 185 extend and retract through apertures 186, 187 in the door periphery 188.

Referring to FIGS. 5, 6, 7, 8 and 9, the door enclosure 164 has two compartments 190, 192 for housing two different mirror image latch mechanisms 200, 202. In this embodiment the door has individual mechanism covers 203, 204. The first or left side latch mechanism 202 is in an exploded view with the second or right side latch mechanism 200 assembled. FIG. 6 shows the opposite or inwardly facing view of the exploded left side latch mechanism components. Each latch mechanism has generally a actuation portion 205, a motion translation portion 206, and a latching portion 207.

In the specific embodiment illustrated, each mechanism is comprised of a sliding actuating portion 210 which includes a respective manual handle 170, 172, connecting portion 218, a pair of connecting links configured as a rack 224, and a central aperture 225. The lifting linkages include a cam surface 226 or second lifting portion configured as a ramp, lateral guide slots 232, 234, a central guide slot 236, and spacers 240, 242 configured as posts. The lifting linkages 220, 222 cooperate with latching arms 250, 252 which include the latching portions 184, 185, and guide members 258, 259 configured as guide pins extending from the linkages. The guide pins ride in and are captured by the lateral guide slots 232, 234. The latching arms also have stop members 268 configured as nubs which extend from the front face 274 of the latching arms. The back side of the latching arms have a first lifting portion 276 configured as a cam follower with a ramp engagement surface 277 which engages the second lifting portion on the lifting linkage to provide the inward-outward motion of the latching portion. The cover pieces 203, 204 retain the components in place and may be

attached ideally my non-metallic screws at screw holes 282 into post 284.

A gear member 290 configured as a pinion is rotatably seated on a post 294. The gear member engages the rack on the connecting portion 218 to horizontally move same when the pinion is rotated. The gear member has a key receiver configured as a latch key slot 298 for receiving a robotic latch key 300. The key receiver constitutes a first actuation portion and the manual handle constitutes a second actuation portion which both actuate the motion translation portion comprised of the rack and pinion mechanism and the connecting linkages. Alternate motion translation portions may be used and still be within the scope of particular aspects of the invention.

The latch mechanism operates analogously to the latch mechanism of FIGS. 17, 18a, 19a, 19b, 20, 21, of U.S. application serial number 08/891,645, which is incorporated herein by reference, although a rotatable cammed member is not utilized. Rather the sliding handle portion with the attached lifting linkages are utilized to laterally move said linkages. In the 08/891,645 application, the latching are also is engaged with the rotatable cammed member. In the instant case the latching arm is captured by the lifting linkage and the up down motion is controlled and limited by the configuration of structure on the covers 203, 204.

The individual parts of the door mechanism 100 may be suitably formed of carbon fiber polycarbonate to provide a static dissipative characteristic. The front panel and door

enclosure may be formed of polycarbonate. The latching components may be formed of suitable plastics such as nylons or PEEK.

IN THE CLAIMS:

1. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a handle exteriorly exposed on the front of the door, said handle laterally moveable,

a latch portion for extending into and retracting from the latch receptacle, and

a motion translation portion connecting between the latch portion and the handle for translating lateral motion of the handle into extending and retracting of the latch portion.

2. The wafer carrier of claim 1 wherein the latching mechanism is not within a door enclosure.

3. The wafer carrier of claim 1 wherein the motion translation portion comprises a rack and pinion.

4. The wafer container of claim 1 wherein the door has a left side and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

5. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

    a latch portion for engaging with the latch receptacle,  
    a first actuation portion for receiving manual or robotic actuation, and  
    a motion translation portion connecting between the latch portion and the actuation portion for translating actuation of the handle into engagement of the latch portion with the latch receptacle,

the latching mechanism exposed on the front of the door providing access to said mechanism.

6. The wafer container of claim 5 wherein the latching mechanism further comprises a second actuation portion, and wherein the second actuation portion is a rotatable latch key receiver and the first actuation portion is a manually operable handle.

7. The wafer container of claim 6 wherein the manually operable handle is non-rotatable.

8. The wafer container of claim 5 wherein the motion translation portion comprises a rack and a pinion mechanism.

9. The wafer container of claim 5 wherein the latching mechanism comprises:

a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said

first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

10. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a actuation portion for receiving external actuation, the actuation portion exteriorly accessible and rotatable,  
a latch portion for engagement with the latch receptacle,  
a pinion connected to the actuation portion, and

a rack engaged with the pinion and connecting to the latch portion, whereby rotation of the actuation portion moves the latch portion.

11. The wafer container of claim 10 wherein the door has a front and the latch mechanism is exposed on the front of the door.

12. The wafer container of claim 10 wherein the actuation portion is a first actuation portion and wherein the latch mechanism further comprises a second actuation portion that is constrained to move laterally, the second actuation portion connecting to the rack, whereby the latch mechanism may be actuated by either rotating the first actuation mechanism or by laterally moving the second actuation member.

13. The wafer container of claim 12 wherein the door has a front and the latch mechanism is exposed on the front.

14. The wafer container of claim 10 wherein the door has a front, a left side, and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

15. A wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a forward facing door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,

a first rotatable actuation portion for receiving robotic actuation with a key,

a second laterally moveable actuation portion for manual actuation,

a motion translation portion connecting between the latch portion and the first robotic actuation portion and between the latch portion and the second laterally moveable actuation portion for translating actuation of said actuation portions into engagement of the latch portion with the latch receptacle.

16. The wafer carrier of claim 15 wherein the motion translation portion comprises a rack and pinion.

17. The wafer carrier of claim 15 wherein the door has a front and wherein the latch mechanism is exposed at said front.

18. The wafer carrier of claim 15 wherein the latching mechanism is a first latching mechanism and the wafer carrier

further comprises a second latching mechanism that is substantially a mirror image of the first latching mechanism.

19. The wafer carrier of claim 15 wherein the motion translation portion provides a laterally outward motion to the latching portion and a motion in a forward direction.

20. A wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening, the door having an open interior and comprising:
  - i) an outer seating portion sized for engaging with the generally rectangular door frame, the outer seating portion having a opening corresponding to the latch receptacle when the door is placed in the door frame;
  - ii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door;
  - iii) a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide

configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

iv) a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

21. The wafer carrier of claim 20 further comprising a rack and pinion gear system connected to the sliding handle portion, the pinion accessible from exterior of the door whereby the door can be robotically operated by engagement with said pinion.

22. A wafer carrier comprising:

a) a container portion for holding wafers in a horizontal arrangement, the container portion having a open front and a latch receptacle on the container portion at the open front; and

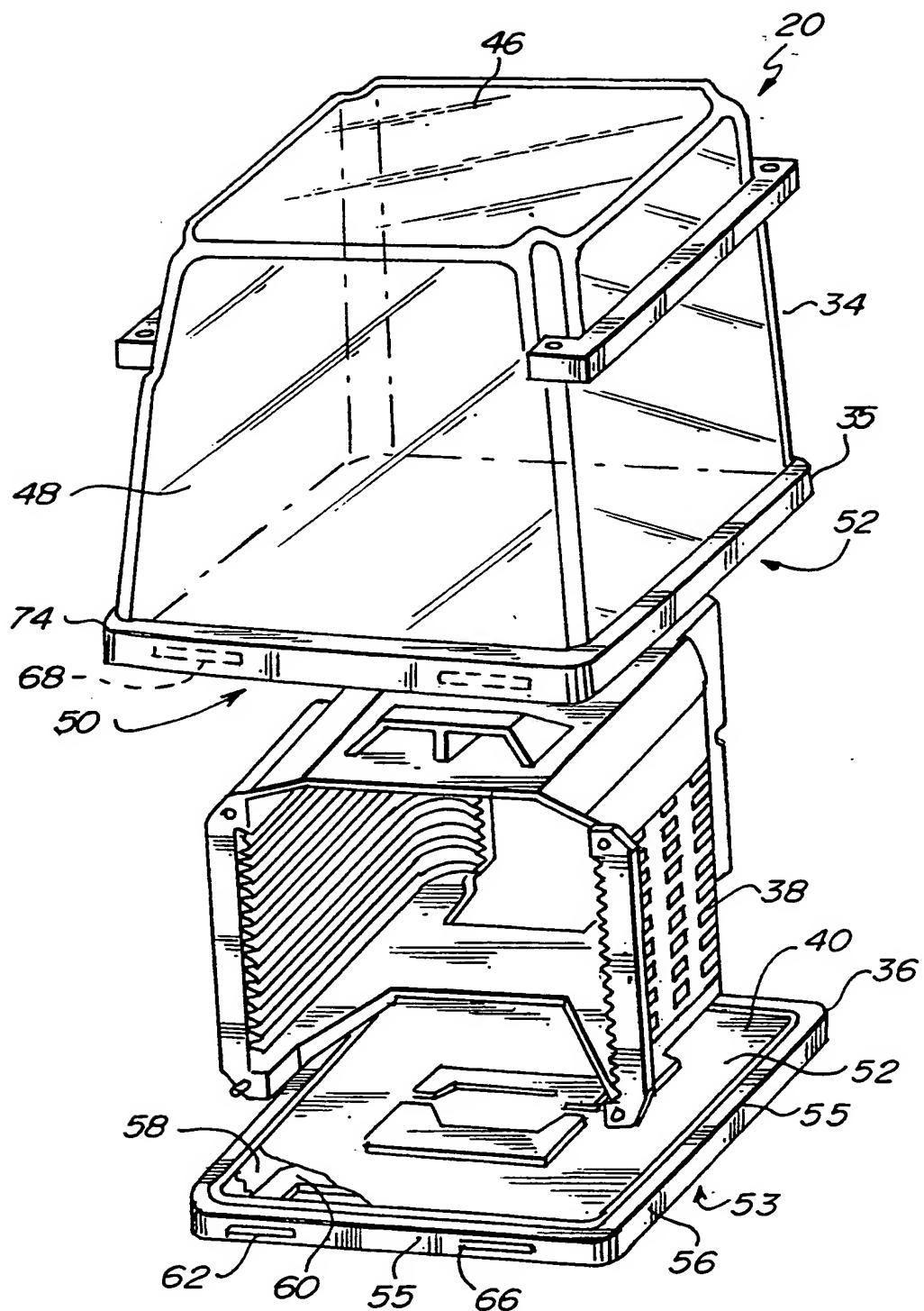
b) a door placeable to close the open front, the door comprising;

i) a latching arm having a latching portion extendable outwardly in a first direction towards the latch receptacle; and

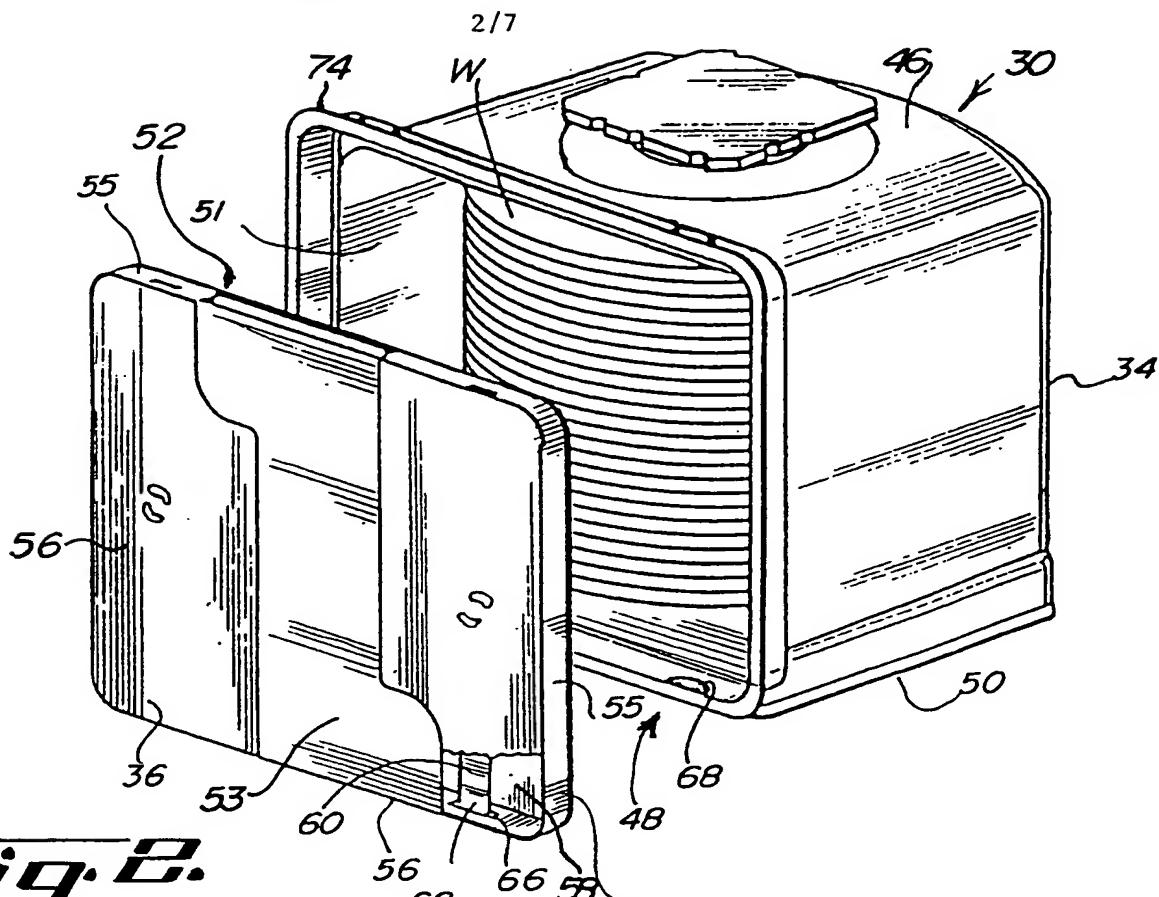
- ii) a lifting linkage adjacent the latch linkage and moveable in a direction substantially parallel to the first direction, at least one of the lifting linkage and the latching arm having a ramp such that when the other of the lifting linkage and the latching portion moves with respect to the ramp, the ramp causes the latching linkage to be moved in a second direction substantially normal to the first direction;
- iii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door and a connecting portion connecting the handle to the lifting linkage, whereby the door may be operated by moving the exteriorly exposed handle, the handle portion further comprising g a linear gear fixed thereto; and
- iv) a rotatable circular gear within the door enclosure engaged with the linear gear, the circular gear accessible from the front exterior of the door whereby the door may be robotically operated.

23. The wafer carrier of claim 3 wherein the sliding handle portion is integral with the lifting linkage.

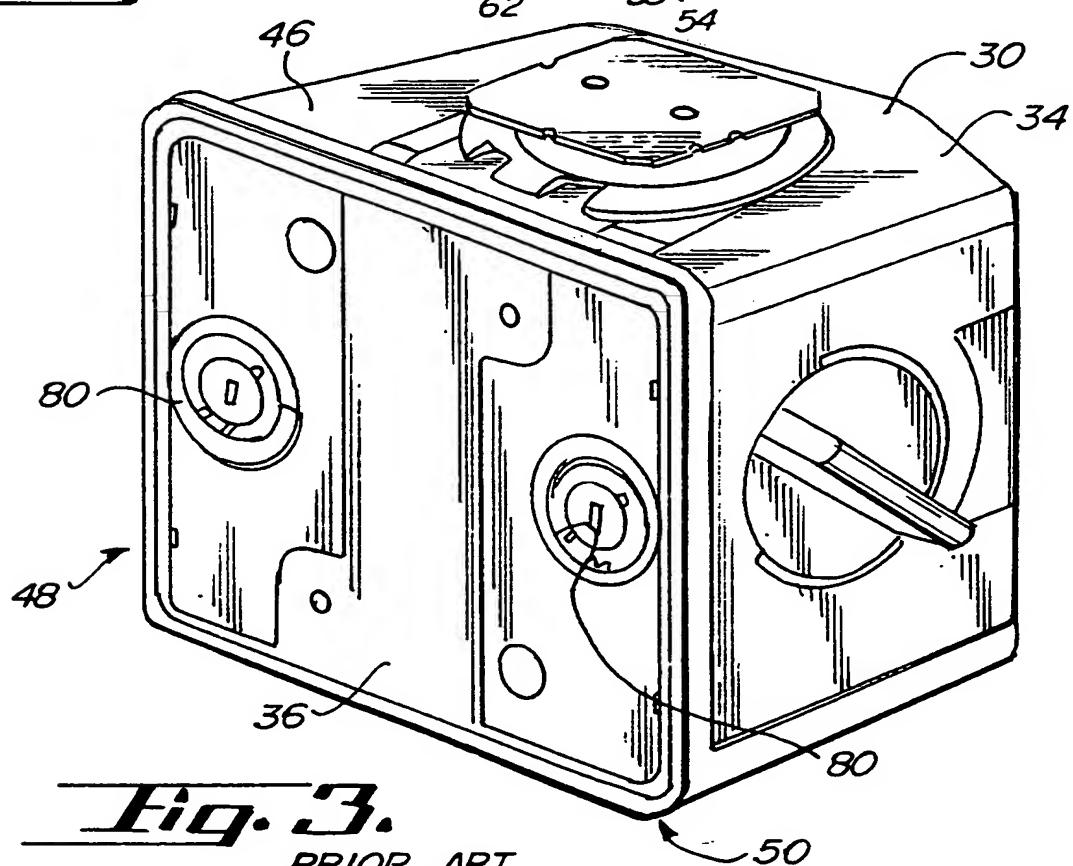
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***Fig. 1.***  
PRIOR ART

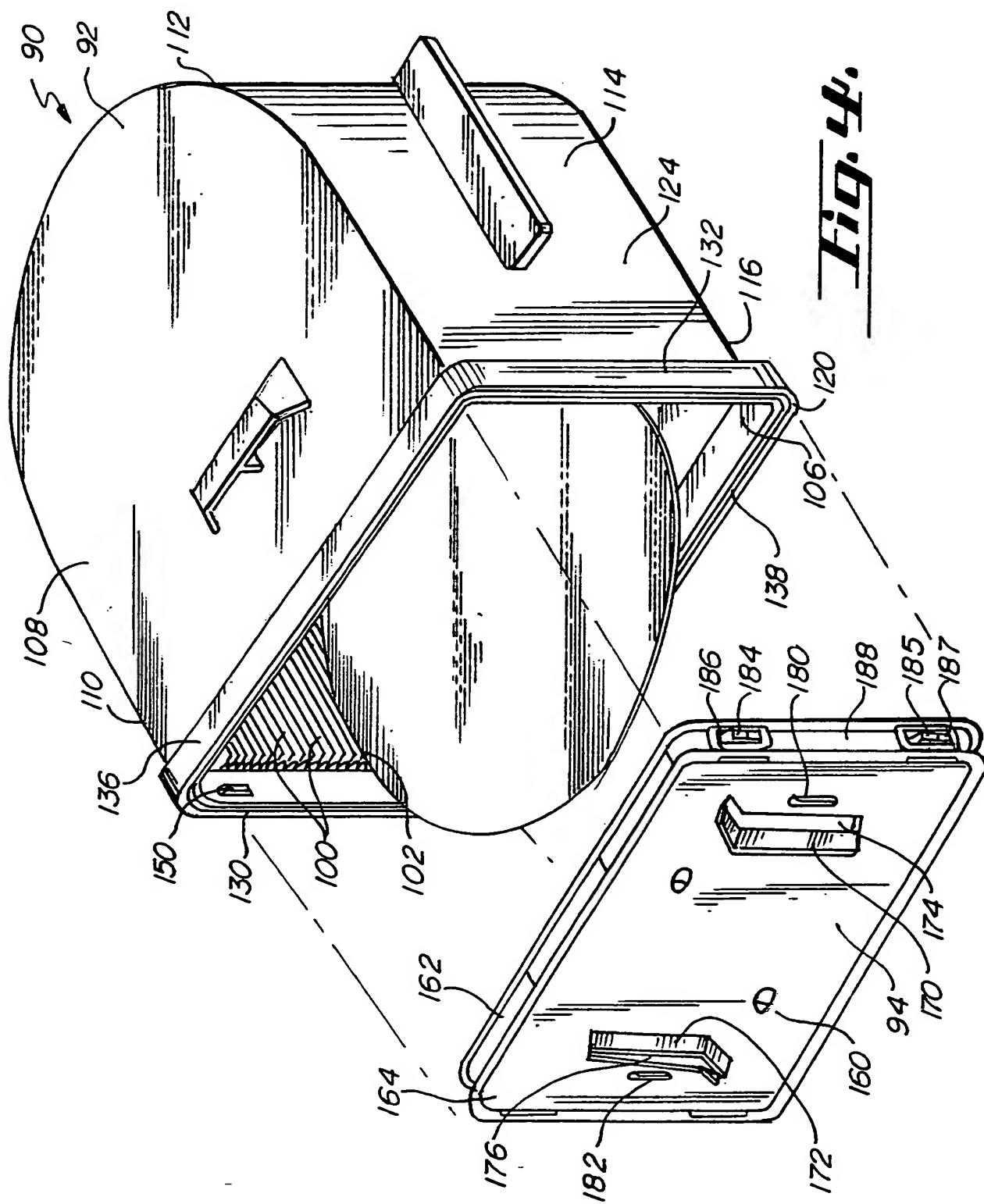


*Fig. 2.*



*Fig. 3.*

PRIOR ART



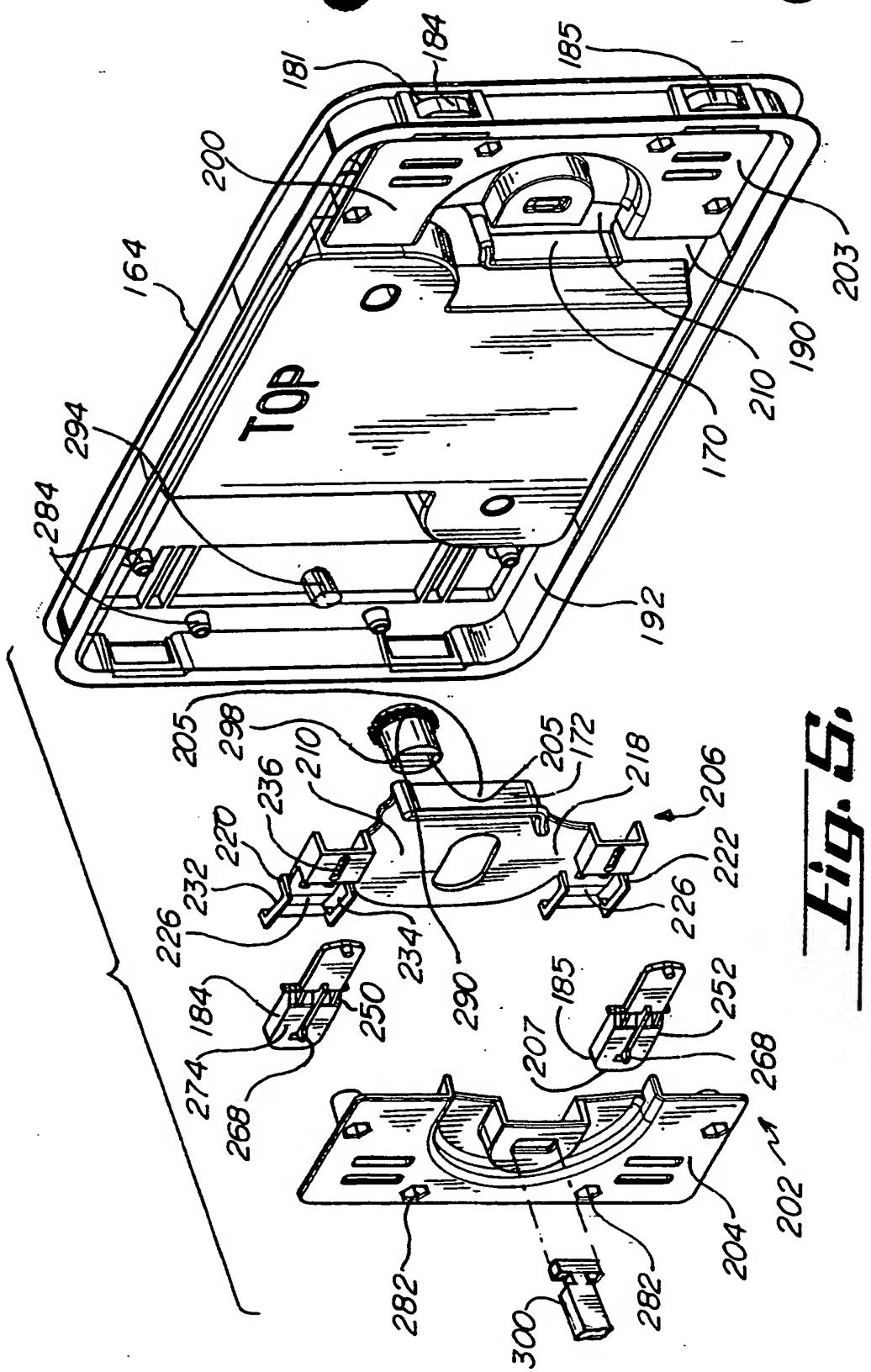


Fig. 5

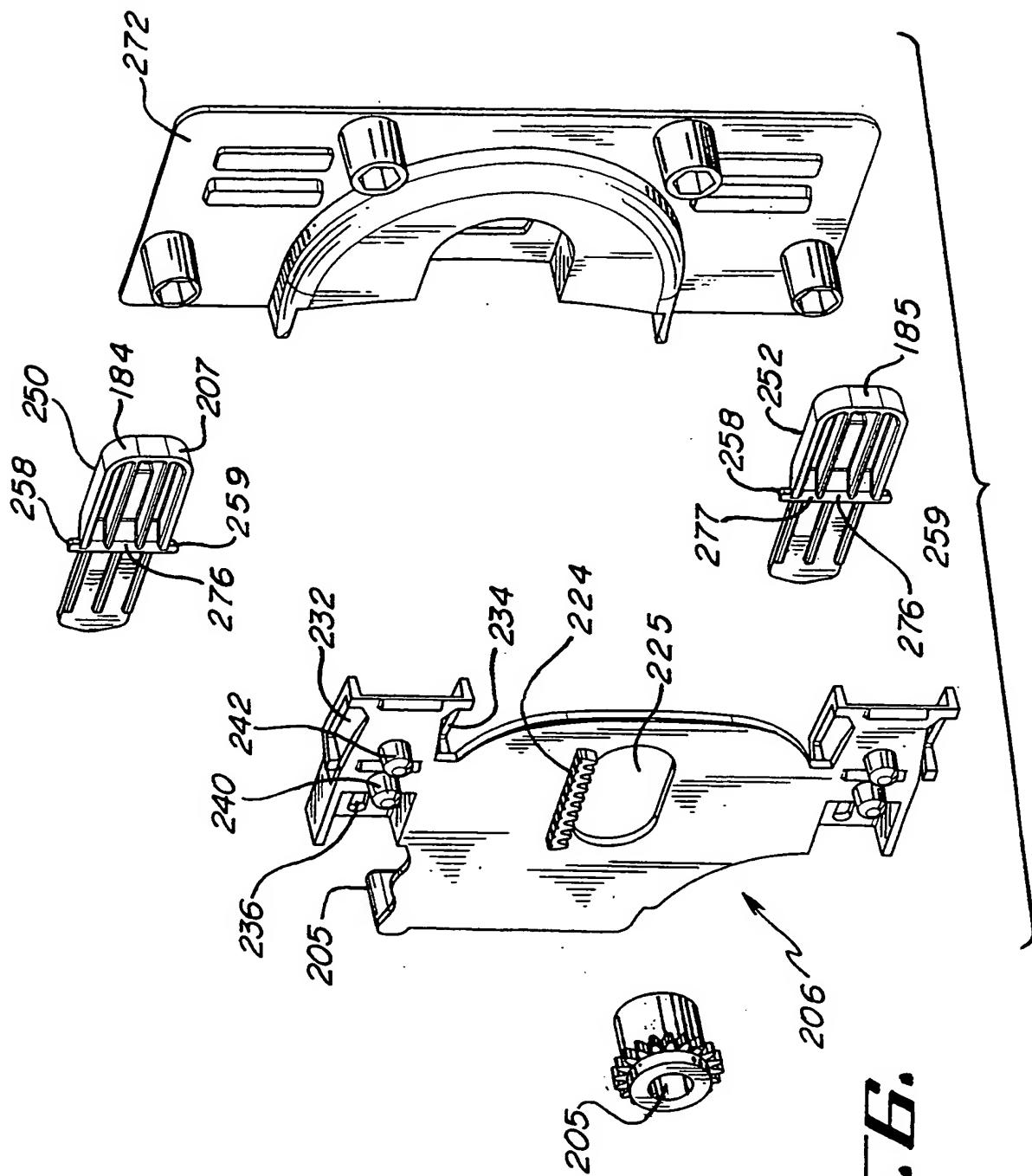
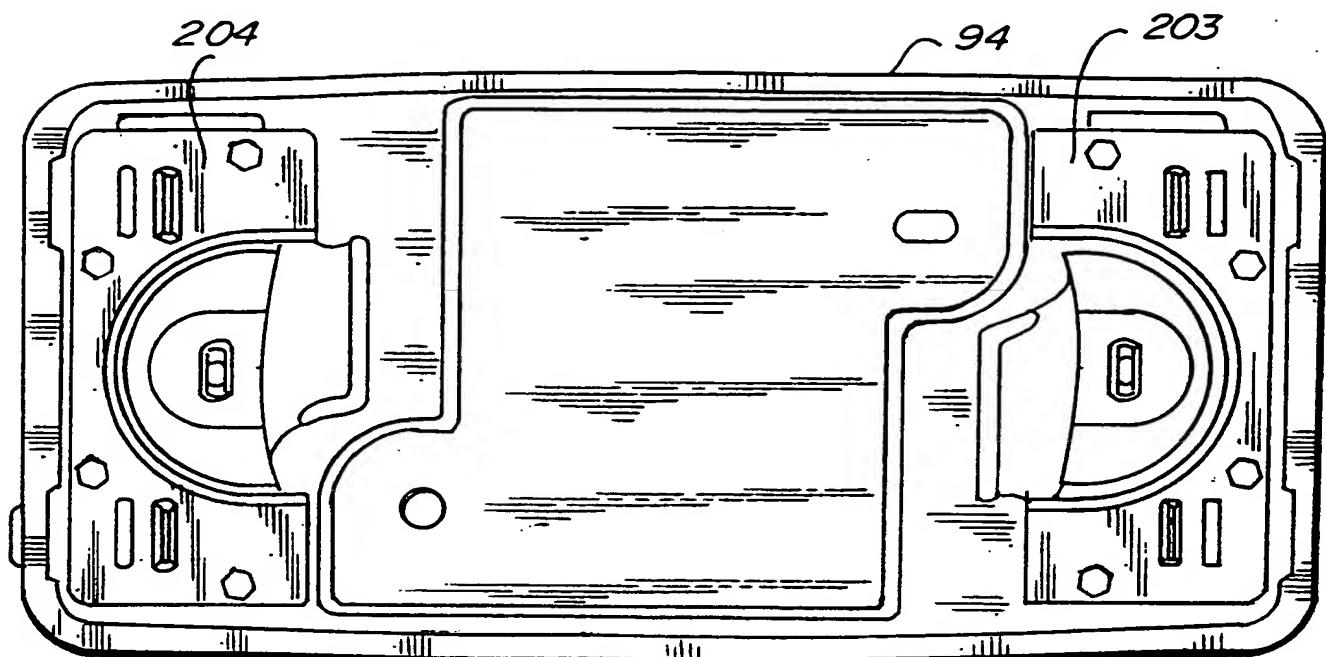
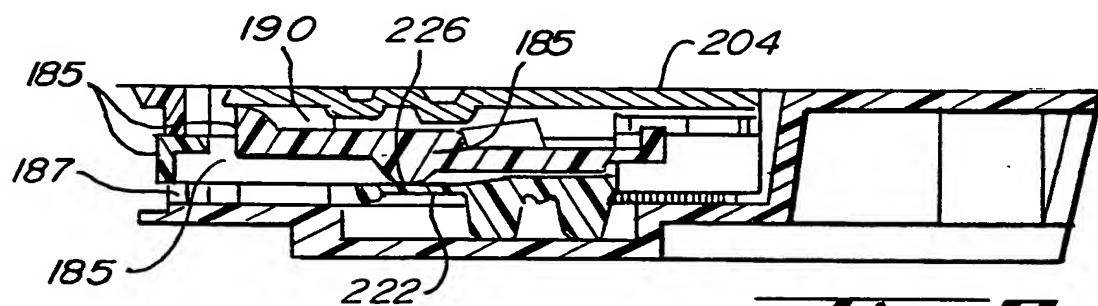


Fig. 6.

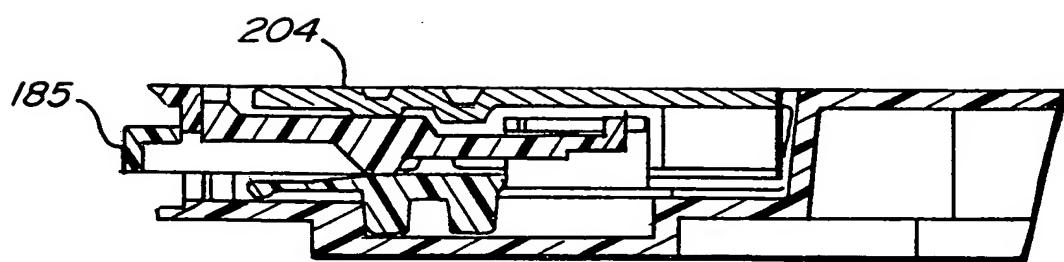
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*Fig. 3.*

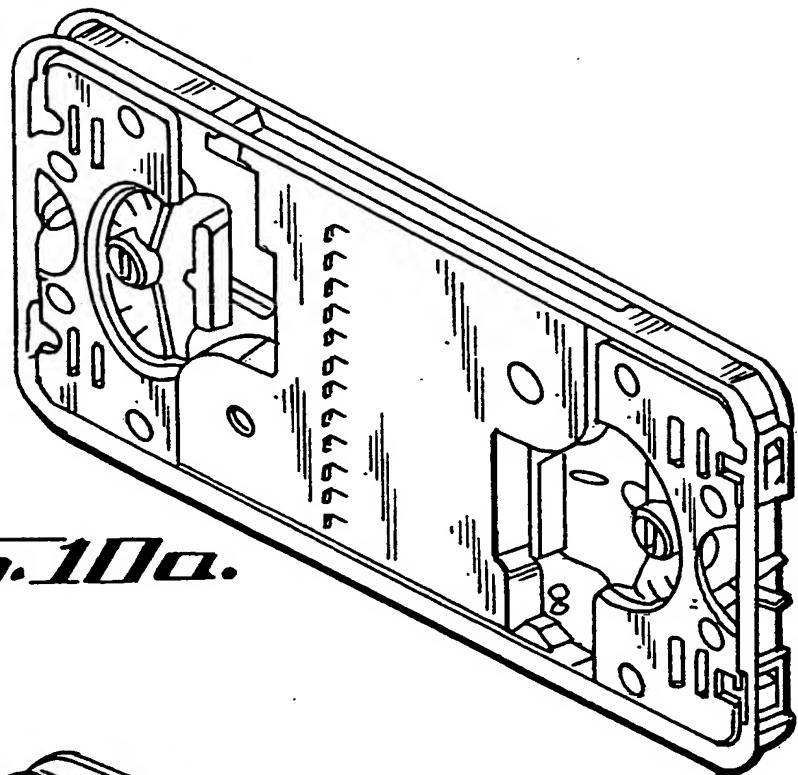


*Fig. 8.*

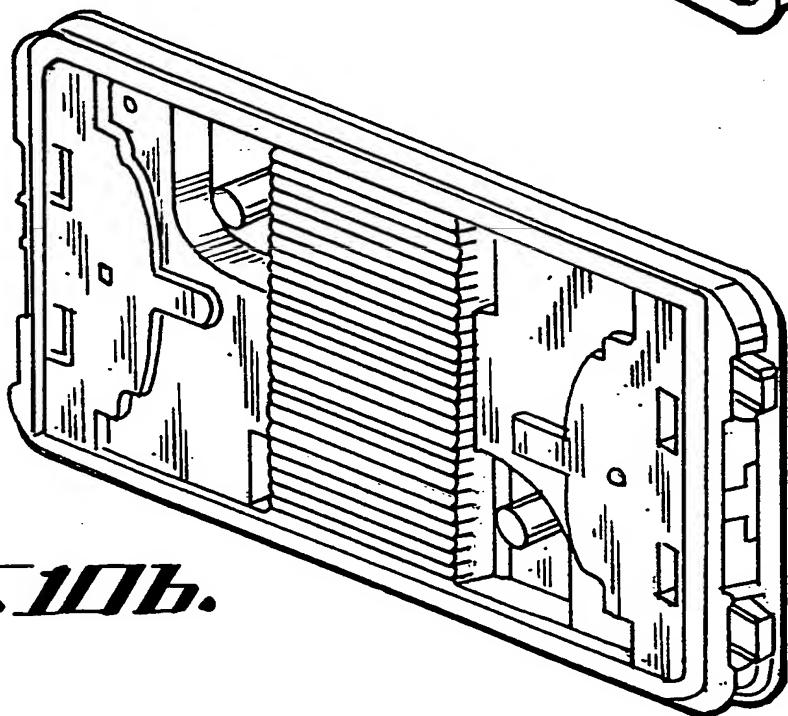


*Fig. 9.*

7/7



*Fig. 10a.*



*Fig. 10b.*

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US00/18511

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B65D 85/90

US CL :206/711; 414/217.1

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 206/454, 711; 211/41.18; 414/217, 217.1, 292, 416.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category*           | Citation of document, with indication, where appropriate, of the relevant passages                                  | Relevant to claim No.                 |
|---------------------|---|---------------------------------------|
| X                   | US 5,173,273 A (BREWER) 22 December 1992, see Figures 1, 2, 2a, and column 4, line 7 through column 6, line 43.     | 1, 2, 4, 5                            |
| X                   | US 5,711,427 A (NYSETH) 27 January 1998, Figures 1, 2, 7, and column 2, line 33 through column 3, line 57.          | 5, 6                                  |
| X,P<br>-----<br>Y,P | US 5,988,392 A (HOSOI) 23 November 1999, see Figure 6 and column 6, lines 49-51.                                    | 10, 12, 14, 15, 17<br>-----<br>13, 16 |
| Y                   | US 5,915,562 A (NYSETH et al) 29 June 1999, see Figures 1 and 23, column 3, lines 16-39, and column 7, lines 15-37. | 13, 16                                |

 Further documents are listed in the continuation of Box C. See patent family annex.

|   |     |  |
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| * Special categories of cited documents:  | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  |
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| "O" document referring to an oral disclosure, use, exhibition or other means  |     |  |
| "P" document published prior to the international filing date but later than the priority date claimed  |     |  |

Date of the actual completion of the international search

26 SEPTEMBER 2000

Date of mailing of the international search report

18 OCT 2000

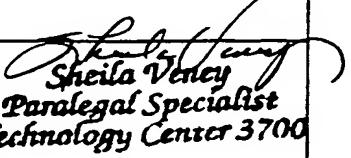
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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

**(19) World Intellectual Property Organization  
International Bureau**



**(43) International Publication Date  
18 January 2001 (18.01.2001)**

PCT

**(10) International Publication Number  
WO 01/04022 A1**

- |   |                             |   |
|---|-----------------------------|---|
| (51) International Patent Classification <sup>7</sup> :   | B65D 85/90                  | (74) Agents: CHRISTENSEN, Douglas, J. et al.; Patterson, Thuente & Skaar, P.A., 4800 IDS Center, 80 South 8th Street, Minneapolis, MN 55402-2100 (US).  |
| (21) International Application Number:  | PCT/US00/18511              |   |
| (22) International Filing Date:   | 6 July 2000 (06.07.2000)    | (81) Designated States ( <i>national</i> ): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW. |
| (25) Filing Language:   | English                     |   |
| (26) Publication Language:  | English                     |   |
| (30) Priority Data:   |                             | (84) Designated States ( <i>regional</i> ): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  |
| (60/142,831   | 8 July 1999 (08.07.1999) US |   |
| (71) Applicant ( <i>for all designated States except US</i> ): FLU-OROWARE, INC. [US/US]; 3500 Lyman Boulevard, Chaska, MN 55318 (US).  |                             |   |
| (72) Inventors; and   |                             | <b>Published:</b>   |
| (75) Inventors/Applicants ( <i>for US only</i> ): BORES, Gregory, W. [US/US]; 16611 Lyons Avenue SE, Prior Lake, MN 55372 (US). ZABKA, Michael, C. [US/US]; 75 Edgewood Court, Barron, WI 54812 (US). |                             | <ul style="list-style-type: none"> <li>— <i>With international search report.</i></li> <li>— <i>With amended claims.</i></li> </ul>   |
|   |                             | <b>Date of publication of the amended claims:</b> 15 February 2001  |

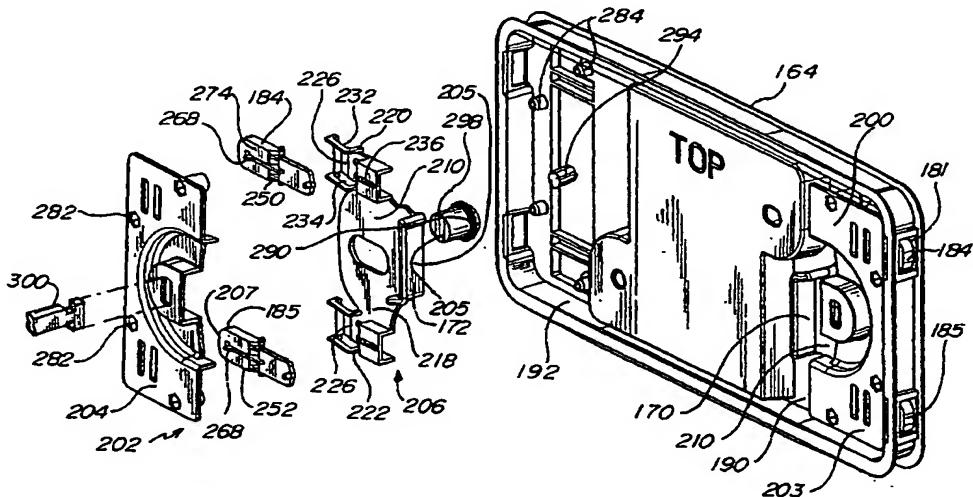
**Published:**

- *With international search report.*
  - *With amended claims.*

**Date of publication of the amended claims: 15 February 2001**

[Continued on next page]

**(54) Title: TRANSPORT MODULE WITH LATCHING DOOR**



**(57) Abstract:** A wafer container with door receiving frame and a door sized therefor. The door (94) includes latching linkages (250, 252) that extend, lift, lower and retract latching portions from the door and into and out of latch receptacles (150) in the door frame. Each latching mechanism utilizes a sliding plate (210) with a connected handle (170, 172) exposed on the front of the door. The sliding plate has lifting linkages (220, 222) cooperating with the latching linkages. Moving the handles extends the latching portions into the latching receptacles. By way of a ramped surface (226) and follower surface (277) on the overlapping linkages, the latching portions then move in a direction normal to the first direction to pull the door inwardly and seal the door to the container. The sliding plate includes a rack portion (224) engaged with a pinion (290). The pinion is accessible from the door front by a latch key (300).

WO 01/04022 A1



*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**AMENDED CLAIMS**

[received by the International Bureau on 18 December 2000 (18.12.00);  
original claims 1, 2, 5, 10, 12, 13 and 17 amended;  
remaining claims unchanged (7 pages)]

1. A sealable container for enclosing wafers, the container comprising:
  - a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle; and
  - b) a door placeable in the door frame to cover the door opening and seal with the container portion thereby sealing the wafers in the container, the door having a front and comprising:  
an outer seating portion sized for engaging with the generally rectangular door frame, and  
a latching mechanism comprising:  
a handle exteriorly exposed on the front of the door, said handle laterally moveable,  
a latch portion for extending into and retracting from the latch receptacle, and  
a motion translation portion connecting between the latch portion and the handle for translating lateral motion of the handle into extending and retracting of the latch portion.
2. The wafer carrier of claim 1 wherein the motion translation portion is not within a door enclosure.
3. The wafer carrier of claim 1 wherein the motion translation portion comprises a rack and pinion.
4. The wafer container of claim 1 wherein the door has a left side and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.
5. A wafer container comprising:
  - a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame.

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,  
a first actuation portion for receiving manual and robotic actuation, and  
a motion translation portion connecting between the latch portion and the actuation portion for translating actuation of the handle into engagement of the latch portion with the latch receptacle.

the motion translation portion mounted and exposed on the front of the door providing access to said motion translation portion.

6. The wafer container of claim 5 wherein the latching mechanism further comprises a second actuation portion, and wherein the second actuation portion is a rotatable latch key receiver and the first actuation portion is a manually operable handle.

7. The wafer container of claim 6 wherein the manually operable handle is non-rotatable.

8. The wafer container of claim 5 wherein the motion translation portion comprises a rack and a pinion mechanism.

9. The wafer container of claim 5 wherein the latching mechanism comprises:

a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable

with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

10. A sealable wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior, an open front, and a generally rectangular door frame at the open front defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening and seal with the container portion, the door comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

- a actuation portion for receiving external actuation, the actuation portion exteriorly accessible and rotatable.
- a latch portion for engagement with the latch receptacle.
- a pinion connected to the actuation portion, and
- a rack engaged with the pinion and connecting to the latch portion, whereby rotation of the actuation portion moves the latch portion.

11. The wafer container of claim 10 wherein the door has a front and the latch mechanism is exposed on the front of the door.

12. The wafer container of claim 10 wherein the actuation portion is a first actuation portion and wherein the latch mechanism further comprises a second actuation portion that is constrained to move laterally, the second actuation portion connecting to the rack, whereby

the latch mechanism may be actuated by either rotating the first actuation portion or by laterally moving the second actuation portion.

13. The wafer container of claim 12 wherein the door has a front and the latching mechanism is exposed on the front.

14. The wafer container of claim 10 wherein the door has a front, a left side, and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

15. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a forward facing door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle.

a first rotatable actuation portion for receiving robotic actuation with a key,

a second laterally moveable actuation portion for manual actuation,

a motion translation portion connecting between the latch portion and the first robotic actuation portion and between the latch portion and the second laterally moveable actuation portion for translating actuation of said actuation portions into engagement of the latch portion with the latch receptacle.

16. The wafer carrier of claim 15 wherein the motion translation portion comprises a rack and pinion.

17. The wafer carrier of claim 15 wherein the latch mechanism is mounted on said front and is not contained within a door enclosure.

18. The wafer carrier of claim 15 wherein the latching mechanism is a first latching mechanism and the wafer carrier further comprises a second latching mechanism that is substantially a mirror image of the first latching mechanism.

19. The wafer carrier of claim 15 wherein the motion translation portion provides a laterally outward motion to the latching portion and a motion in a forward direction.

20. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having an open interior and comprising:

i) an outer seating portion sized for engaging with the generally rectangular door frame, the outer seating portion having an opening corresponding to the latch receptacle when the door is placed in the door frame;

ii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door;

iii) a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

iv) a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

21. The wafer carrier of claim 20 further comprising a rack and pinion gear system connected to the sliding handle portion, the pinion accessible from exterior of the door whereby the door can be robotically operated by engagement with said pinion.

22. A wafer carrier comprising:

a) a container portion for holding wafers in a horizontal arrangement, the container portion having an open front and a latch receptacle on the container portion at the open front; and

b) a door placeable to close the open front, the door comprising;

i) a latching arm having a latching portion extendable outwardly in a first direction towards the latch receptacle; and

ii) a lifting linkage adjacent the latch linkage and moveable in a direction substantially parallel to the first direction, at least one of the lifting linkage and the latching arm having a ramp such that when the other of the lifting linkage and the latching portion moves with respect to the ramp, the ramp causes the latching linkage to be moved in a second direction substantially normal to the first direction;

iii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door and a connecting portion connecting the handle to the lifting linkage, whereby the

door may be operated by moving the exteriorly exposed handle, the handle portion further comprising a linear gear fixed thereto; and

iv) a rotatable circular gear within the door enclosure engaged with the linear gear, the circular gear accessible from the front exterior of the door whereby the door may be robotically operated.

23. The wafer carrier of claim 3 wherein the sliding handle portion is integral with the lifting linkage.

Reed on 18 Mar 02

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REPLACED BY  
ART 34, R&DT  
IN THE CLAIMS:

1. A wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening, the door having a front and comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a handle exteriorly exposed on the front of the door, said handle laterally moveable,

a latch portion for extending into and retracting from the latch receptacle, and

a motion translation portion connecting between the latch portion and the handle for translating lateral motion of the handle into extending and retracting of the latch portion.

2. The wafer carrier of claim 1 wherein the latching mechanism is not within a door enclosure.

3. The wafer carrier of claim 1 wherein the motion translation portion comprises a rack and pinion.

4. The wafer container of claim 1 wherein the door has a left side and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

5. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,

a first actuation portion for receiving manual or robotic actuation, and

a motion translation portion connecting between the latch portion and the actuation portion for translating actuation of the handle into engagement of the latch portion with the latch receptacle,

the latching mechanism exposed on the front of the door providing access to said mechanism.

6. The wafer container of claim 5 wherein the latching mechanism further comprises a second actuation portion, and wherein the second actuation portion is a rotatable latch key receiver and the first actuation portion is a manually operable handle.

7. The wafer container of claim 6 wherein the manually operable handle is non-rotatable.

8. The wafer container of claim 5 wherein the motion translation portion comprises a rack and a pinion mechanism.

9. The wafer container of claim 5 wherein the latching mechanism comprises:

a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said

first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

10. A wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening, the door comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

- a actuation portion for receiving external actuation, the actuation portion exteriorly accessible and rotatable,
- a latch portion for engagement with the latch receptacle,
- a pinion connected to the actuation portion, and

a rack engaged with the pinion and connecting to the latch portion, whereby rotation of the actuation portion moves the latch portion.

11. The wafer container of claim 10 wherein the door has a front and the latch mechanism is exposed on the front of the door.

12. The wafer container of claim 10 wherein the actuation portion is a first actuation portion and wherein the latch mechanism further comprises a second actuation portion that is constrained to move laterally, the second actuation portion connecting to the rack, whereby the latch mechanism may be actuated by either rotating the first actuation mechanism or by laterally moving the second actuation member.

13. The wafer container of claim 12 wherein the door has a front and the latch mechanism is exposed on the front.

14. The wafer container of claim 10 wherein the door has a front, a left side, and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

15. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a forward facing door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,

a first rotatable actuation portion for receiving robotic actuation with a key,

a second laterally moveable actuation portion for manual actuation,

a motion translation portion connecting between the latch portion and the first robotic actuation portion and between the latch portion and the second laterally moveable actuation portion for translating actuation of said actuation portions into engagement of the latch portion with the latch receptacle.

16. The wafer carrier of claim 15 wherein the motion translation portion comprises a rack and pinion.

17. The wafer carrier of claim 15 wherein the door has a front and wherein the latch mechanism is exposed at said front.

18. The wafer carrier of claim 15 wherein the latching mechanism is a first latching mechanism and the wafer carrier

further comprises a second latching mechanism that is substantially a mirror image of the first latching mechanism.

19. The wafer carrier of claim 15 wherein the motion translation portion provides a laterally outward motion to the latching portion and a motion in a forward direction.

20. A wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening, the door having an open interior and comprising:
  - i) an outer seating portion sized for engaging with the generally rectangular door frame, the outer seating portion having a opening corresponding to the latch receptacle when the door is placed in the door frame;
  - ii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door;
  - iii) a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide

configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

iv) a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

21. The wafer carrier of claim 20 further comprising a rack and pinion gear system connected to the sliding handle portion, the pinion accessible from exterior of the door whereby the door can be robotically operated by engagement with said pinion.

22. A wafer carrier comprising:

a) a container portion for holding wafers in a horizontal arrangement, the container portion having a open front and a latch receptacle on the container portion at the open front; and

b) a door placeable to close the open front, the door comprising;

i) a latching arm having a latching portion extendable outwardly in a first direction towards the latch receptacle; and

- ii) a lifting linkage adjacent the latch linkage and moveable in a direction substantially parallel to the first direction, at least one of the lifting linkage and the latching arm having a ramp such that when the other of the lifting linkage and the latching portion moves with respect to the ramp, the ramp causes the latching linkage to be moved in a second direction substantially normal to the first direction;
- iii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door and a connecting portion connecting the handle to the lifting linkage, whereby the door may be operated by moving the exteriorly exposed handle, the handle portion further comprising g a linear gear fixed thereto; and
- iv) a rotatable circular gear within the door enclosure engaged with the linear gear, the circular gear accessible from the front exterior of the door whereby the door may be robotically operated.

23. The wafer carrier of claim 3 wherein the sliding handle portion is integral with the lifting linkage.

RECEIVED

PATENT COOPERATION TREATY

OCT 23 2001

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PATTERSON, THUENTE, SKAAR  
& CHRISTENSEN, P.A.

PCT

To: DOUGLAS J. CHRISTENSEN  
PATTERSON, THUENTE & SKAAR, P.A.  
4800 IDS CENTER  
80 SOUTH 8TH STREET  
MINNEAPOLIS, MINNESOTA 55402-2100

NOTIFICATION OF TRANSMITTAL OF  
INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing  
(day/month/year)

18 OCT 2001

Applicant's or agent's file reference

2267.507WO01

IMPORTANT NOTIFICATION

International application No.

PCT/US00/18511

International filing date (day/month/year)

06 JULY 2000

Priority Date (day/month/year)

08 JULY 1999

Applicant

FLUOROWARE, INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer  
*Foster*  
JIMMY G. FOSTER

Telephone No. (703) 308-1148

*Sheila Veney*  
Paralegal Specialist  
Technology Center 3700

Form PCT/IPEA/416 (July 1992)★

Note!  
RMS

## PATENT COOPERATION TREATY

**PCT**

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |  |   |
|---|--|---|
| Applicant's or agent's file reference<br>2267.507WO01   | <b>FOR FURTHER ACTION</b>                                  | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
| International application No.<br>PCT/US00/18511   | International filing date (day/month/year)<br>06 JULY 2000 | Priority date (day/month/year)<br>08 JULY 1999  |
| International Patent Classification (IPC) or national classification and IPC<br>IPC(7): B65D 85/90 and US Cl.: 206/711; 414/217.1 |  |   |
| Applicant<br>FLUOROWARE, INC.   |  |   |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets.

This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

- I  Basis of the report
- II  Priority
- III  Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain documents cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

|  |  |
|--|--|
| Date of submission of the demand<br>06 FEBRUARY 2001   | Date of completion of this report<br>19 SEPTEMBER 2001                   |
| Name and mailing address of the IPEA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231 | Authorized officer<br>JIMMY G. FOSTER<br>Telephone No. (703) 308-1148    |
| Facsimile No. (703) 305-3230   | <i>Sheila V. Vitek</i><br>Paralegal Specialist<br>Technology Center 3700 |

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/18511

**I. Basis of the report**1. With regard to the elements of the international application:<sup>\*</sup> the international application as originally filed the description:pages 1-14, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_ the claims:pages NONE, as originally filed  
pages NONE, as amended (together with any statement) under Article 19  
pages 15-21, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_ the drawings:pages 1-7, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_ the sequence listing part of thedescription: NONE, as originally filed  
pages NONE, filed with the demand  
pages NONE, filed with the letter of \_\_\_\_\_2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.  
These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is: the language of a translation furnished for the purposes of international search (under Rule 23.1(b)). the language of publication of the international application (under Rule 48.3(b)). the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international

 contained in the international application in printed form. filed together with the international application in computer readable form. furnished subsequently to this Authority in written form furnished subsequently to this Authority in computer readable form The statement that the subsequently furnished written sequence listing does not go beyond the scope of the international application as filed has been furnished. The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4.  The amendments have resulted in the cancellation of: the description, pages NONE the claims, Nos. NONE the drawings, sheets fig NONE5.  This report has been drawn as if (some of) the amendment(s) had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\*Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/18511

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

|                               |                                     |     |
|-------------------------------|-------------------------------------|-----|
| Novelty (N)                   | Claims <u>3, 7-14, 16 and 18-23</u> | YES |
|                               | Claims <u>1, 2, 4-6, 15 and 17</u>  | NO  |
| Inventive Step (IS)           | Claims <u>3, 7-14, 16 and 18-23</u> | YES |
|                               | Claims <u>1, 2, 4-6, 15 and 17</u>  | NO  |
| Industrial Applicability (IA) | Claims <u>1-23</u>                  | YES |
|                               | Claims <u>NONE</u>                  | NO  |

**2. citations and explanations (Rule 70.7)**

Claims 1, 2, 4 and 5 lack novelty under PCT Article 33(2) as being anticipated by Brewer (5,173,273). Brewer provides a container at 12, a door at 14, a handle at the opening of slide 70, a latch portion at 96, and a motion translation portion located between said opening and said latch portion.

Although the door 14 is not adapted to seal the frame of the container 12 since the door 14 includes vent openings therein, the present claims do not require that the door seal the container but merely that the door be placeable within the frame during any sealing operation of the container. Although the tray is not intended by Brewer to be sealed, the tray is capable of being sealed by sealing the vent openings of the tray and lid.

Claims 5, 6, 15 and 17 lack novelty under PCT Article 33(2) as being anticipated by Nyseth (5,711,427). Nyseth provides the following: a container at 20, a door at 24, a handle/actuation portion at 81 capable of receiving robotic actuation, latch receptacles at 72,74, a latching portion at 118, and a motion translation portion at 110,120. As broadly as the claims are drafted, the panel 96 of the door of Nyseth may be considered to define a front portion. The apertures 186 in this front portion 96 partially expose said translation portion. In addition, element 112-114 may be considered to define a manually operable and laterally movable handle, insofar as claimed. Regarding claim 17, the entire latching mechanism of Nyseth is not contained since at least the actuation portion 81 is exposed.

Claims 3, 10-14 and 16 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a rack and pinion mechanism connected between a latching portion and a laterally movable handle in a sealable door container.

Claims 7, 22 and 23 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest an actuation portion combination that includes both a rotatable latch key/circular gear and a non-rotatable/slidable handle, in a container latching mechanism that includes a latch portion.

(Continued on Supplemental Sheet.)

**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

International application No.

PCT/US00/18511

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

**I. BASIS OF REPORT:**

5. (Some) amendments are considered to go beyond the disclosure as filed:

NONE

**V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):**

Claim 8 meets the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest an exposed motion translation portion that includes a rack and pinion mechanism, in a container latching mechanism that further includes a latch portion and an actuation portion.

Claims 9, 20 and 21 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest in the combination of a door and a container and a latching mechanism, the latching mechanism including a latching arm, a first cam guide, a latch linkage and a lifting linkage wherein the lifting linkage is connected to a sliding handle, with the lifting linkage and latch linkage including a ramp and a ramp engaging surface.

Claim 18 meets the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest in a container having a door and container portion, providing a mirror-image pair of latch mechanisms in which each mechanism includes a rotatable actuation portion, a second laterally movable actuation portion, a motion translation portion and a latching portion. Nyseth (5,711,427) instead provides a common actuation portion for latching both sides of the door to the opening of the container.

Claim 19 meets the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest in a container having a door and container portion, providing a latch mechanism which includes a latching portion, a rotatable actuation portion, a second laterally movable actuation portion and a motion translation portion, wherein the motion translation portion provides both outward motion to the latching portion and a motion in a forward direction.

**----- NEW CITATIONS -----**

NONE

## PENT COOPERATION TREA

**PCT**

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

REC'D 23 OCT 2001

(PCT Article 36 and Rule 70)

IPEA

PCT

14

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|---|--|---|
| Applicant's or agent's file reference<br>2267.507WO01   | <b>FOR FURTHER ACTION</b>                                  | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
| International application No.<br>PCT/US00/18511   | International filing date (day/month/year)<br>06 JULY 2000 | Priority date (day/month/year)<br>08 JULY 1999  |
| International Patent Classification (IPC) or national classification and IPC<br>IPC(7): B65D 85/90 and US Cl.: 206/711; 414/217.1 |  |   |
| Applicant<br>FLUOROWARE, INC.   |  |   |

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- II  Priority
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- IV  Lack of unity of invention
- V  Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
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- VII  Certain defects in the international application
- VIII  Certain observations on the international application

|  |   |
|--|---|
| Date of submission of the demand<br>06 FEBRUARY 2001   | Date of completion of this report<br>19 SEPTEMBER 2001                |
| Name and mailing address of the IPEA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703) 305-3230 | Authorized officer<br>JIMMY G. FOSTER<br>Telephone No. (703) 308-1148 |
| <p>Sheila Veney<br/>Paralegal Specialist<br/>Technology Center 3700</p>  |   |

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/18511

**I. Basis of the report****1. With regard to the elements of the international application:\*** the international application as originally filed the description:pages: 1-14 , as originally filed  
pages: NONE  
pages: NONE , filed with the demand the claims:pages: NONE , as originally filed  
pages: NONE , as amended (together with any statement) under Article 19  
pages: 15-21  
pages: NONE , filed with the demand the drawings:pages: 1-7 , as originally filed  
pages: NONE  
pages: NONE , filed with the demand the sequence listing part of thedescription: NONE , as originally filed  
pages: NONE , filed with the demand  
pages: NONE , filed with the letter of**2. With regard to the language, all the elements marked above were available or furnished to the Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to the Authority in the following language \_\_\_\_\_ which is:

 the language of a translation furnished for the purpose of international search (under Rule 23.1(b)). the language of publication of the international application (under Rule 48.3(b)). the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international** contained in the international application in printed form. filed together with the international application in computer readable form furnished subsequently to the Authority in written form furnished subsequently to the Authority in computer readable form The statement that the subsequently furnished written sequence listing referred to in Article 14 of the international application as filed has been furnished The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.**4.  The amendment(s) have resulted in the cancellation of:** the description, pages: NONE the claim(s) No.: NONE the drawing(s) sheet(s) NONE**5.  The report has been drawn up if (one or) the amendment(s) had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 75.3(c)).***\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).**\*\*Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/18511

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. statement**

|                               |        |                              |     |
|-------------------------------|--------|------------------------------|-----|
| Novelty (N)                   | Claims | <u>3, 7-14, 16 and 18-23</u> | YES |
|                               | Claims | <u>1, 2, 4-6, 15 and 17</u>  | NO  |
| Inventive Step (IS)           | Claims | <u>3, 7-14, 16 and 18-23</u> | YES |
|                               | Claims | <u>1, 2, 4-6, 15 and 17</u>  | NO  |
| Industrial Applicability (IA) | Claims | <u>1-23</u>                  | YES |
|                               | Claims | <u>NONE</u>                  | NO  |

**2. citations and explanations (Rule 70.7)**

Claims 1, 2, 4 and 5 lack novelty under PCT Article 33(2) as being anticipated by Brewer (5,173,273). Brewer provides a container at 12, a door at 14, a handle at the opening of slide 70, a latch portion at 96, and a motion translation portion located between said opening and said latch portion.

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Claims 8, 10-14 and 16 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a rack and pinion mechanism connected between a latching portion and a laterally movable handle in a sealable door container.

Claims 7, 22 and 23 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest an actuation portion combination that includes both a rotatable latch key/circular gear and a non-rotatable/slidable handle, in a container latching mechanism that includes a latch portion.

(Continued on Supplemental Sheet.)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/18541

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

I. BASIS OF REPORT:

5. (Some) amendments are considered to go beyond the disclosure as filed:

NONE

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):

Claim 8 meets the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest an exposed motion translation portion that includes a rack and pinion mechanism, in a container latching mechanism that further includes a latch portion and an actuation portion.

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Claim 18 meets the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest in a container having a door and container portion, providing a mirror-image pair of latch mechanisms in which each mechanism includes a rotatable actuation portion, a second laterally movable actuation portion, a motion translation portion and a latching portion. Nyseth (5,711,427) instead provides a common actuation portion for latching both sides of the door to the opening of the container.

Claim 19 meets the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest in a container having a door and container portion, providing a latch mechanism which includes a latching portion, a rotatable actuation portion, a second laterally movable actuation portion and a motion translation portion, wherein the motion translation portion provides both outward motion to the latching portion and a motion in a forward direction.

----- NEW CITATIONS -----

NONE

IN THE CLAIMS:

1. A sealable container for enclosing wafers, the container comprising:
  - a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle; and
  - b) a door placeable in the door frame to cover the door opening and seal with the container portion thereby sealing the wafers in the container, the door having a front and comprising:  
an outer seating portion sized for engaging with the generally rectangular door frame, and  
a latching mechanism comprising:  
a handle exteriorly exposed on the front of the door, said handle laterally moveable,  
a latch portion for extending into and retracting from the latch receptacle, and  
a motion translation portion connecting between the latch portion and the handle for translating lateral motion of the handle into extending and retracting of the latch portion.
2. The wafer carrier of claim 1 wherein the motion translation portion is not within a door enclosure.
3. The wafer carrier of claim 1 wherein the motion translation portion comprises a rack and pinion.
4. The wafer container of claim 1 wherein the door has a left side and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.
5. A wafer container comprising:
  - a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,  
a first actuation portion for receiving manual and robotic actuation, and  
a motion translation portion connecting between the latch portion and the actuation portion for translating actuation of the handle into engagement of the latch portion with the latch receptacle,

the motion translation portion mounted and exposed on the front of the door providing access to said motion translation portion.

6. The wafer container of claim 5 wherein the latching mechanism further comprises a second actuation portion, and wherein the second actuation portion is a rotatable latch key receiver and the first actuation portion is a manually operable handle.

7. The wafer container of claim 6 wherein the manually operable handle is non-rotatable.

8. The wafer container of claim 5 wherein the motion translation portion comprises a rack and a pinion mechanism.

9. The wafer container of claim 5 wherein the latching mechanism comprises:

a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable

with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

10. A sealable wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior, an open front, and a generally rectangular door frame at the open front defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening and seal with the container portion, the door comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

- a actuation portion for receiving external actuation, the actuation portion exteriorly accessible and rotatable,
- a latch portion for engagement with the latch receptacle,
- a pinion connected to the actuation portion, and
- a rack engaged with the pinion and connecting to the latch portion, whereby rotation of the actuation portion moves the latch portion.

11. The wafer container of claim 10 wherein the door has a front and the latch mechanism is exposed on the front of the door.

12. The wafer container of claim 10 wherein the actuation portion is a first actuation portion and wherein the latch mechanism further comprises a second actuation portion that is constrained to move laterally, the second actuation portion connecting to the rack, whereby

the latch mechanism may be actuated by either rotating the first actuation portion or by laterally moving the second actuation portion.

13. The wafer container of claim 12 wherein the door has a front and the latching mechanism is exposed on the front.

14. The wafer container of claim 10 wherein the door has a front, a left side, and a right side, and wherein the latch mechanism is a first-latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

15. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a forward facing door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,

a first rotatable actuation portion for receiving robotic actuation with a key,

a second laterally moveable actuation portion for manual actuation,

a motion translation portion connecting between the latch portion and the first robotic actuation portion and between the latch portion and the second laterally moveable actuation portion for translating actuation of said actuation portions into engagement of the latch portion with the latch receptacle.

16. The wafer carrier of claim 15 wherein the motion translation portion comprises a rack and pinion.

17. The wafer carrier of claim 15 wherein the latch mechanism is mounted on said front and is not contained within a door enclosure.
18. The wafer carrier of claim 15 wherein the latching mechanism is a first latching mechanism and the wafer carrier further comprises a second latching mechanism that is substantially a mirror image of the first latching mechanism.
19. The wafer carrier of claim 15 wherein the motion translation portion provides a laterally outward motion to the latching portion and a motion in a forward direction.
20. A wafer container comprising:
- a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;
  - b) a door placeable in the door frame to cover the door opening, the door having an open interior and comprising:
    - i) an outer seating portion sized for engaging with the generally rectangular door frame, the outer seating portion having an opening corresponding to the latch receptacle when the door is placed in the door frame;
    - ii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door;
    - iii) a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

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- iv) a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.
21. The wafer carrier of claim 20 further comprising a rack and pinion gear system connected to the sliding handle portion, the pinion accessible from exterior of the door whereby the door can be robotically operated by engagement with said pinion.
22. A wafer carrier comprising:
- a container portion for holding wafers in a horizontal arrangement, the container portion having an open front and a latch receptacle on the container portion at the open front; and
- a door placeable to close the open front, the door comprising:
    - i) a latching arm having a latching portion extendable outwardly in a first direction towards the latch receptacle; and
    - ii) a lifting linkage adjacent the latch linkage and moveable in a direction substantially parallel to the first direction, at least one of the lifting linkage and the latching arm having a ramp such that when the other of the lifting linkage and the latching portion moves with respect to the ramp, the ramp causes the latching linkage to be moved in a second direction substantially normal to the first direction;
    - iii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door and a connecting portion connecting the handle to the lifting linkage, whereby the

door may be operated by moving the exteriorly exposed handle, the handle portion further comprising a linear gear fixed thereto; and

iv) a rotatable circular gear within the door enclosure engaged with the linear gear, the circular gear accessible from the front exterior of the door whereby the door may be robotically operated.

23. The wafer carrier of claim 3 wherein the sliding handle portion is integral with the lifting linkage.

# REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) 2267.507WO01

**Box No. I TITLE OF INVENTION**

TRANSPORT MODULE WITH LATCHING DOOR

**Box No. II APPLICANT**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

FLUOROWARE, INC.  
3500 Lyman Boulevard  
Chaska, Minnesota 55318  
United States of America

This person is also inventor.

Telephone No.

(612) 556-3131

Facsimile No.

(612) 556-8023

Teleprinter No.

State (that is, country) of nationality:  
US

State (that is, country) of residence:  
US

This person is applicant  all designated States  all designated States except the United States of America  the United States of America only  the States indicated in the Supplemental Box

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

BORES, Gregory W.  
16611 Lyons Avenue SE  
Prior Lake, Minnesota 55372  
United States of America

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:  
US

State (that is, country) of residence:  
US

This person is applicant  all designated States  all designated States except the United States of America  the United States of America only  the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on a continuation sheet.

**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:  agent  common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

CHRISTENSEN, Douglas J.  
PATTERSON, THUENTE & SKAAR, P.A.  
4800 IDS Center  
80 South 8th Street  
Minneapolis, Minnesota 55402-2100  
United States of America

Telephone No.

(612) 349-3001

Facsimile No.

(612) 349-9266

Teleprinter No.

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

If none of the following sub-boxes is used, this sheet should not be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

ZABKA, Michael C.  
75 Edgewood Court  
Barron, Wisconsin 54812  
United States of America

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:  
US

State (that is, country) of residence:  
US

This person is applicant for the purposes of:  all designated States  all designated States except the United States of America  the United States of America only  the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:  all designated States  all designated States except the United States of America  the United States of America only  the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:  all designated States  all designated States except the United States of America  the United States of America only  the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

applicant only

applicant and inventor

inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:  all designated States  all designated States except the United States of America  the United States of America only  the States indicated in the Supplemental Box

Further applicants and/or (further) inventors are indicated on another continuation sheet.

**Box No.V DESIGNATION OF STATES**

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

**Regional Patent**

- AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

**National Patent (if other kind of protection or treatment desired, specify on dotted line):**

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> AE United Arab Emirates                  | <input checked="" type="checkbox"/> LR Liberia                                   |
| <input checked="" type="checkbox"/> AL Albania                               | <input checked="" type="checkbox"/> LS Lesotho                                   |
| <input checked="" type="checkbox"/> AM Armenia                               | <input checked="" type="checkbox"/> LT Lithuania                                 |
| <input checked="" type="checkbox"/> AT Austria                               | <input checked="" type="checkbox"/> LU Luxembourg                                |
| <input checked="" type="checkbox"/> AU Australia                             | <input checked="" type="checkbox"/> LV Latvia                                    |
| <input checked="" type="checkbox"/> AZ Azerbaijan                            | <input checked="" type="checkbox"/> MA Morocco                                   |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina                | <input checked="" type="checkbox"/> MD Republic of Moldova                       |
| <input checked="" type="checkbox"/> BB Barbados                              | <input checked="" type="checkbox"/> MG Madagascar                                |
| <input checked="" type="checkbox"/> BG Bulgaria                              | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BR Brazil                                | <input checked="" type="checkbox"/> MN Mongolia                                  |
| <input checked="" type="checkbox"/> BY Belarus                               | <input checked="" type="checkbox"/> MW Malawi                                    |
| <input checked="" type="checkbox"/> CA Canada                                | <input checked="" type="checkbox"/> MX Mexico                                    |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein  | <input checked="" type="checkbox"/> NO Norway                                    |
| <input checked="" type="checkbox"/> CN China                                 | <input checked="" type="checkbox"/> NZ New Zealand                               |
| <input checked="" type="checkbox"/> CR Costa Rica                            | <input checked="" type="checkbox"/> PL Poland                                    |
| <input checked="" type="checkbox"/> CU Cuba                                  | <input checked="" type="checkbox"/> PT Portugal                                  |
| <input checked="" type="checkbox"/> CZ Czech Republic                        | <input checked="" type="checkbox"/> RO Romania                                   |
| <input checked="" type="checkbox"/> DE Germany                               | <input checked="" type="checkbox"/> RU Russian Federation                        |
| <input checked="" type="checkbox"/> DK Denmark                               | <input checked="" type="checkbox"/> SD Sudan                                     |
| <input checked="" type="checkbox"/> DM Dominica                              | <input checked="" type="checkbox"/> SE Sweden                                    |
| <input checked="" type="checkbox"/> EE Estonia                               | <input checked="" type="checkbox"/> SG Singapore                                 |
| <input checked="" type="checkbox"/> ES Spain                                 | <input checked="" type="checkbox"/> SI Slovenia                                  |
| <input checked="" type="checkbox"/> FI Finland                               | <input checked="" type="checkbox"/> SK Slovakia                                  |
| <input checked="" type="checkbox"/> GB United Kingdom                        | <input checked="" type="checkbox"/> SL Sierra Leone                              |
| <input checked="" type="checkbox"/> GD Grenada                               | <input checked="" type="checkbox"/> TJ Tajikistan                                |
| <input checked="" type="checkbox"/> GE Georgia                               | <input checked="" type="checkbox"/> TM Turkmenistan                              |
| <input checked="" type="checkbox"/> GH Ghana                                 | <input checked="" type="checkbox"/> TR Turkey                                    |
| <input checked="" type="checkbox"/> GM Gambia                                | <input checked="" type="checkbox"/> TT Trinidad and Tobago                       |
| <input checked="" type="checkbox"/> HR Croatia                               | <input checked="" type="checkbox"/> TZ United Republic of Tanzania               |
| <input checked="" type="checkbox"/> HU Hungary                               | <input checked="" type="checkbox"/> UA Ukraine                                   |
| <input checked="" type="checkbox"/> ID Indonesia                             | <input checked="" type="checkbox"/> UG Uganda                                    |
| <input checked="" type="checkbox"/> IL Israel                                | <input checked="" type="checkbox"/> US United States of America                  |
| <input checked="" type="checkbox"/> IN India                                 | <input checked="" type="checkbox"/> UZ Uzbekistan                                |
| <input checked="" type="checkbox"/> IS Iceland                               | <input checked="" type="checkbox"/> VN Viet Nam                                  |
| <input checked="" type="checkbox"/> JP Japan                                 | <input checked="" type="checkbox"/> YU Yugoslavia                                |
| <input checked="" type="checkbox"/> KE Kenya                                 | <input checked="" type="checkbox"/> ZA South Africa                              |
| <input checked="" type="checkbox"/> KG Kyrgyzstan                            | <input checked="" type="checkbox"/> ZW Zimbabwe                                  |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea |  |
| <input checked="" type="checkbox"/> KR Republic of Korea                     |  |
| <input checked="" type="checkbox"/> KZ Kazakhstan                            |  |
| <input checked="" type="checkbox"/> LC Saint Lucia                           |  |
| <input checked="" type="checkbox"/> LK Sri Lanka                             |  |

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

- AG Antigua and Barbuda DZ Algeria  
 MZ Mozambique (also under ARIPO) BZ Belize

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

**Supplemental Box***If the Supplemental Box is not used, this sheet should not be included in the request.*

1. If, in any of the Boxes, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No. ...." [indicate the number of the Box] and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:

- (i) if more than two persons are involved as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
  - (ii) if, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;
  - (iii) if, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
  - (iv) if, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;
  - (v) if, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;
  - (vi) if, in Box No. VI, there are more than three earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI;
  - (vii) if, in Box No. VI, the earlier application is an ARIPO application: in such case, write "Continuation of Box No. VI", specify the number of the item corresponding to that earlier application and indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed.
2. If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.
3. If the applicant claims, in respect of any designated Office, the benefits of provisions of the national law concerning non-prejudicial disclosures or exceptions to lack of novelty: in such case, write "Statement concerning non-prejudicial disclosures or exceptions to lack of novelty" and furnish that statement below.

CONTINUATION OF BOX NO. IV:

PATTERSON, James H.  
 THUENTE, John F.  
 SKAAR, Randall T.  
 ALEXANDER, Wm. Larry  
 BAXTER, Kimberly K.  
 BONDI, Michael A.  
 CHADWICK, Eric H.  
 DOLAN, John F.  
 HIENZ III, William M.

all of PATTERSON, THUENTE & SKAAR, P.A.  
 4800 IDS Center  
 80 South 8th Street  
 Minneapolis, Minnesota 55402-2100  
 United States of America

**Box No. VI PRIORITY CLAIM** Further priority claims are indicated in the Supplemental Box.

| Filing date<br>of earlier application<br>(day/month/year) | Number<br>of earlier application | Where earlier application is:    |  |  |
|---|----------------------------------|----------------------------------|--|--|
|   |                                  | national application:<br>country | regional application:<br>regional Office | international application:<br>receiving Office |
| item (1)<br>08 July 1999 (08/07/99)                       | 60/142,831                       | US                               |  |  |
| item (2)  |                                  |                                  |  |  |
| item (3)  |                                  |                                  |  |  |

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): (1)

\* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

|   |  |        |                              |
|---|--|--------|------------------------------|
| Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): | Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority): |        |                              |
| ISA / US  | Date (day/month/year)  | Number | Country (or regional Office) |

**Box No. VIII CHECK LIST; LANGUAGE OF FILING**

|   |  |
|---|--|
| This international application contains the following number of sheets: | This international application is accompanied by the item(s) marked below:                                       |
| request : 5   | 1. <input checked="" type="checkbox"/> fee calculation sheet   |
| description (excluding sequence listing part) : 14                      | 2. <input type="checkbox"/> separate signed power of attorney  |
| claims : 9  | 3. <input type="checkbox"/> copy of general power of attorney, reference number, if any:                         |
| abstract : 1  | 4. <input type="checkbox"/> statement explaining lack of signature   |
| drawings : 8  | 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):                            |
| sequence listing part of description : -0-                              | 6. <input type="checkbox"/> translation of international application into (language):                            |
| Total number of sheets : 37   | 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material |
|   | 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form              |
|   | 9. <input checked="" type="checkbox"/> other (specify): Transmittal Letter; Return Postcard Receipt              |

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: English

**Box No. IX SIGNATURE OF APPLICANT OR AGENT**

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



Douglas J. CHRISTENSEN, Reg. No. 35,480

**For receiving Office use only**

|   |  |
|---|--|
| 1. Date of actual receipt of the purported international application:   | 2. Drawings:   |
| 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application: | <input type="checkbox"/> received:<br><input type="checkbox"/> not received:             |
| 4. Date of timely receipt of the required corrections under PCT Article 11(2):  |  |
| 5. International Searching Authority (if two or more are competent): ISA /  | 6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid. |

**For International Bureau use only**

Date of receipt of the record copy by the International Bureau:

PCT

FEE CALCULATION SHEET  
Annex to the Request

For receiving Office use only

International application No.

Applicant's or agent's  
file reference 2267.507WO01

Date stamp of the receiving Office

Applicant  
FLUOROWARE, INC.

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . . 240.00

T

2. SEARCH FEE . . . . . 700.00

S

International search to be carried out by US

(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 37 sheets.

first 30 sheets . . . . . 427.00 b1

7 x 10.00 = 70.00 b2  
remaining sheets additional amount

Add amounts entered at b1 and b2 and enter total at B . . . . . 497.00 B

Designation Fees

The international application contains 108 designations.

8 x 92.00 = 736.00 D

number of designation fees amount of designation fee  
payable (maximum 8)

Add amounts entered at B and D and enter total at I . . . . . 1233 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) . . . . . 15.00 P

5. TOTAL FEES PAYABLE . . . . . 1248.00

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

The designation fees are not paid at this time. No fees are being paid at this time.

MODE OF PAYMENT

authorization to charge  
deposit account (see below)  
 cheque  
 postal money order

bank draft  
 cash  
 revenue stamps

coupons  
 other (specify):

DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)

The RO/ US  is hereby authorized to charge the total fees indicated above to my deposit account.

(this check-box may be marked only if the conditions for deposit accounts of the receiving Office so permit) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

16-0631

Deposit Account No.

Date (day/month/year)

Signature

The demand must be filed directly with the competent International Preliminary Examining Authority or two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:  
IPEA/ USPTO

# PCT

## CHAPTER II

### DEMAND

under Article 31 of the Patent Cooperation Treaty:  
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

| For International Preliminary Examining Authority use only  |   |
|---|---|
| Identification of IPEA  | Date of receipt of DEMAND   |
| <b>Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION</b>  |   |
| International application No.<br>PCT/US00/18511   | International filing date (day/month/year)<br>06 July 2000 (06.07.00) |
| (Earliest) Priority date (day/month/year)<br>08 July 1999 (08.07.99)  |   |
| Title of invention<br><b>TRANSPORT MODULE WITH LATCHING DOOR</b>  |   |
| <b>Box No. II APPLICANT(S)</b>  |   |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)<br><br>FLUOROWARE, INC.<br>3500 Lyman Boulevard<br>Chaska, Minnesota 55318 | Telephone No.:<br>952-556-3131  |
|   | Facsimile No.:<br>952-556-8023  |
|   | Teleprinter No.:  |
| State (that is, country) of nationality:<br>US  | State (that is, country) of residence:<br>US                          |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)  |   |
| State (that is, country) of nationality:  | State (that is, country) of residence:                                |
| Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)  |   |
| State (that is, country) of nationality:  | State (that is, country) of residence:                                |
| <input type="checkbox"/> Further applicants are indicated on a continuation sheet.  |   |

**Continuation of Box No. II APPLICANT(S)***If none of the following sub-boxes is used, this sheet should not be included in the demand.*Name and address: (*Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.*)State (*that is, country*) of nationality:State (*that is, country*) of residence:Name and address: (*Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.*)State (*that is, country*) of nationality:State (*that is, country*) of residence:Name and address: (*Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.*)State (*that is, country*) of nationality:State (*that is, country*) of residence:Name and address: (*Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.*)State (*that is, country*) of nationality:State (*that is, country*) of residence: Further applicants are indicated on another continuation sheet.

**Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The following person is  agent  common representative

and  has been appointed earlier and represents the applicant(s) also for international preliminary examination.

is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: (*Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.*)

Douglas J. CHRISTENSEN  
PATTERSON, THUENTE, SKAAR & CHRISTENSEN, P.A.  
4800 IDS Center  
80 South 8th Street  
Minneapolis, Minnesota 55402-2100  
United States of America

Telephone No.:

(612) 349-5740

Facsimile No.:

(612) 349-9266

Teleprinter No.:

Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION**

## Statement concerning amendments: \*

1. The applicant wishes the international preliminary examination to start on the basis of:

the international application as originally filed

the description  as originally filed

as amended under Article 34

the claims  as originally filed

as amended under Article 19 (together with any accompanying statement)

as amended under Article 34

the drawings  as originally filed

as amended under Article 34

2.  The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3.  The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). (*This check-box may be marked only where the time limit under Article 19 has not yet expired.*)

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English.....

which is the language in which the international application was filed.

which is the language of a translation furnished for the purposes of international search.

which is the language of publication of the international application.

which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

**Box No. V ELECTION OF STATES**

The applicant hereby elects all eligible States (*that is, all States which have been designated and which are bound by Chapter II of the PCT*)

excluding the following States which the applicant wishes not to elect:

**Box No. VI CHECK LIST**

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- |  |     |        |                          |                          |
|--|-----|--------|--------------------------|--------------------------|
| 1. translation of international application                              | : 0 | sheets | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. amendments under Article 34   | : 0 | sheets | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. copy (or, where required, translation) of amendments under Article 19 | : 7 | sheets | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. copy (or, where required, translation) of statement under Article 19  | : 4 | sheets | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. letter  | : 2 | sheets | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. other (specify)   | : 0 | sheets | <input type="checkbox"/> | <input type="checkbox"/> |

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received      not received

The demand is also accompanied by the item(s) marked below:

- |  |   |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet                             | 4. <input type="checkbox"/> statement explaining lack of signature                                  |
| 2. <input type="checkbox"/> separate signed power of attorney                            | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input checked="" type="checkbox"/> other (specify): Return Receipt Postcard                     |

**Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE**

*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).*

Douglas J. CHRISTENSEN

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1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3.  The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.

The applicant has been informed accordingly.

4.  The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5.  Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

## PCT

## FEE CALCULATION SHEET

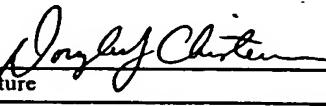
## Annex to the Demand for international preliminary examination

|   |  |  |  |
|---|--|--|--|
| International application No.   | PCT/US00/18511                                     | For International Preliminary Examining Authority use only |  |
| Applicant's or agent's file reference   | 2267.507WO01                                       | Date stamp of the IPEA                                     |  |
| Applicant   |  |  |  |
| Fluoroware, Inc.  |  |  |  |
| <b>Calculation of prescribed fees</b>   |  |  |  |
| 1. Preliminary examination fee .....  | 490.00   | P  |  |
| 2. Handling fee ( <i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i> ) ..... | 137.00   | H  |  |
| 3. Total of prescribed fees<br>Add the amounts entered at P and H and enter total in the TOTAL box .....  | 627.00   | TOTAL  |  |
| <b>Mode of Payment</b>  |  |  |  |
| <input type="checkbox"/> authorization to charge deposit account with the IPEA (see below)  | <input type="checkbox"/> cash                      |  |  |
| <input checked="" type="checkbox"/> cheque  | <input type="checkbox"/> revenue stamps            |  |  |
| <input type="checkbox"/> postal money order   | <input type="checkbox"/> coupons                   |  |  |
| <input type="checkbox"/> bank draft   | <input type="checkbox"/> other ( <i>specify</i> ): |  |  |

**Deposit Account Authorization** (*this mode of payment may not be available at all IPEAs*)

The IPEA/ USPTO  is hereby authorized to charge the total fees indicated above to my deposit account.

(*this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit*) is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

|                        |                             |   |
|------------------------|-----------------------------|---|
| 16-0631                | 06 February 2001 (06.02.01) |  |
| Deposit Account Number | Date (day/month/year)       | Signature   |